

HOW THE BIG GUNS HIT THE MARK

POPULAR MECHANICS

MAGAZINE

IN SO YOU CAN UNDERSTAND IT.

DEC.
25 CENTS

SEE PAGE 855



MOOSE HUNTER FIGHTS FOR LIFE IN RAGING TORRENT!

J. V. KIRSCH
Palmer, Alaska



1 "I bagged a giant moose, the dressed meat weighing 982 pounds," writes Mr. Kirsch. "Starting back to camp at dusk, we foolishly decided to ford Willow Creek, a very fast mountain stream. We figured the 150-pound packs of moose meat would keep our feet on the bottom.

2 "We were wrong! When the water reached my chest, I was swept from my feet and trapped beneath the foaming mountain torrent! Wedged against a rock, and held down by the current and my heavy load, I couldn't budge! I thought I was done for!"



3 "I had been carrying my lighted flashlight in one hand, and still held it. And just in time, one of the packers located me by its beam! He rushed in, seized my pack rope and managed to drag me ashore. I most certainly wouldn't have lived to enjoy that moose meat if those 'Eveready' fresh
DATED batteries had failed me." *(Signed) J. V. Kirsch*

NOTE: An "Eveready" flashlight with "Eveready" batteries, will normally continue to burn under water. Try it!



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H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

December, 1939

Vol. 72, No. 6

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Wonders of Polaroid Glass

POLAROID has started a revolution. Possessed of a magic ability to tame light waves, it has brought motion pictures to the threshold of a three-dimension era and opened an enchanting new world to the amateur and commercial cameraman. Through Polaroid the microphotographer sees mysterious patterns in crystals; a drop of chemical melts into colors of a butterfly's wing. A jeweler tests gems under Polaroid, an engineer studies the stresses in a bridge girder. Your own life inevitably will be affected by this versatile material, whose story is told in the January issue.

Outwitting the Air Raiders

NINE enemy bombers are spotted in the California sky. Observers telephone warnings; lights flash on a headquarters map plotting the raiders' course. A wavering line on a cathode-ray tube signals passage of the planes over a robot listening post. An article next month describes the network of men and machines ready to protect us from attack by air.

Next Month

WHEN the Clipper sweeps down from the sky after a 2,410-mile flight from Hawaii it goes right to Treasure Island's hospital. Two of the four motors may be shipped to Texas for complete rebuilding. Every propeller is dismantled. The under wings that take the shock of the waves come off for inspection and painting every third trip. Sixteen specialists go over every flight and navigation instrument. That's how they keep the sea birds flying, as described in next month's issue.

Filming Fairyland

A CROSS the screen swims a whale of terrifying size, lashing up mountainous seas with its powerful blue-black tail. You forget for a moment that it's only a cartoon whale rampaging in a three-by-five pool. For Hollywood is shooting Fairyland again; and Walt Disney and his staff have learned a lot about color between "Snow White" and the new "Pinocchio," as you'll find when you read the January Coloroto section with eight pages of color pictures.

Blind Man's Buff

FOG hangs a ghostly curtain over the bridge of a liner off Nantucket, blotting out even the bow. A thousand passengers, a \$20,000,000 ship depend on the captain. Without sun or stars he hunts blindly by dead reckoning, by radio, for New York harbor. A story in January gives a thrilling account of how pilot and master fight fog, the peril that has taken 40,000 lives in twenty years.

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*What this
new **DELCO** battery offers*

MORE POWER . . . this new Delco battery makes good the *promise of power* you get from its rugged, substantial appearance. Within its husky case of genuine hard rubber are larger plates and more active material; it teems with extra power for sure starting in zero temperatures—extra capacity for lights, radio, heater and other accessories—extra stamina to assure long and dependable service.

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When jobs are looking for men —that's news!



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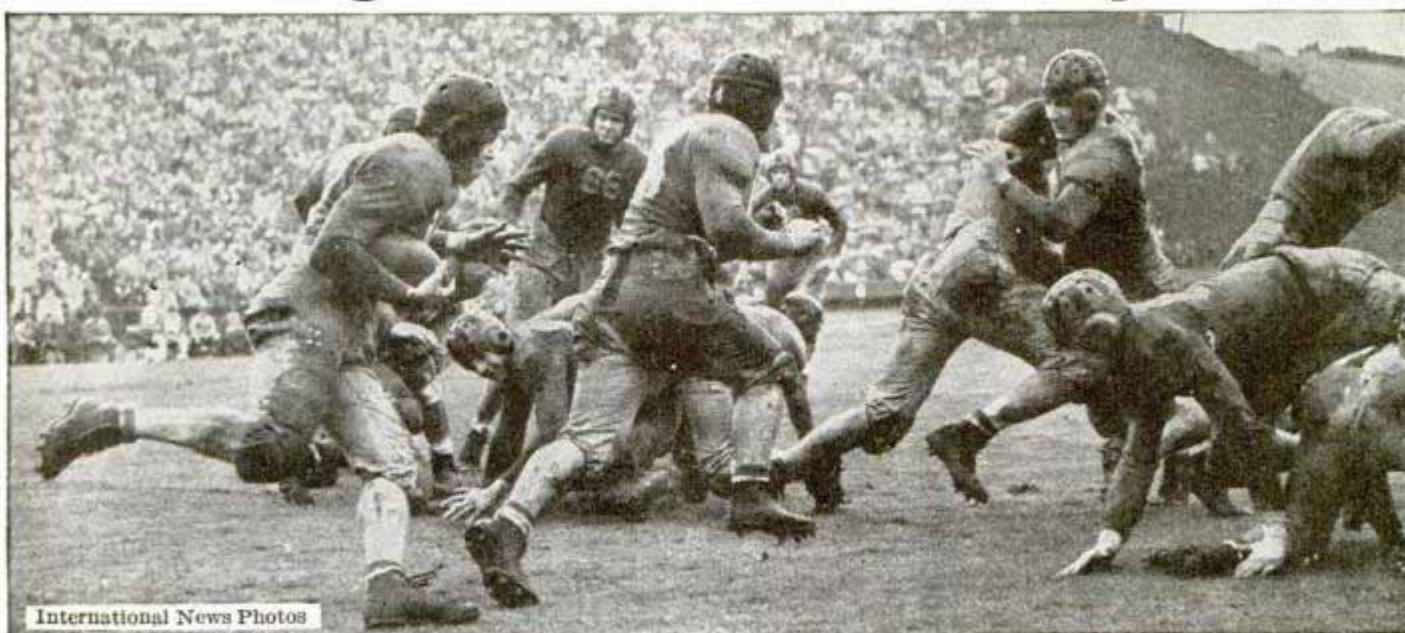
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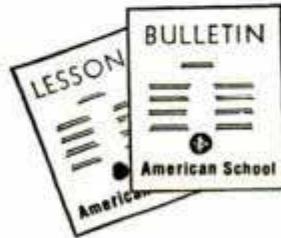
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pays many Radio
Technicians \$30,
\$40, \$50 a week.
Others hold their
regular jobs and
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Technician

\$40, \$50 A WEEK

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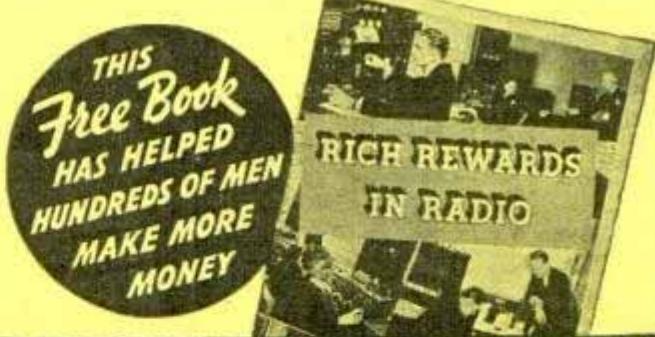
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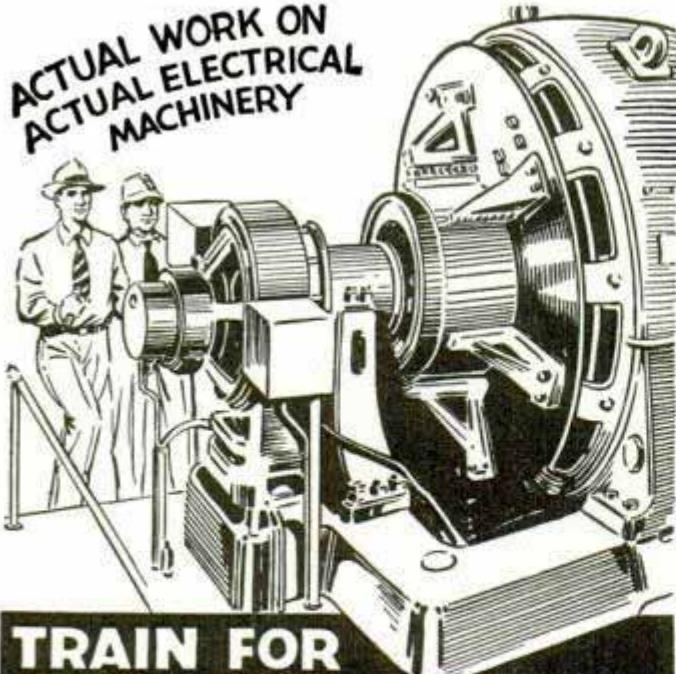
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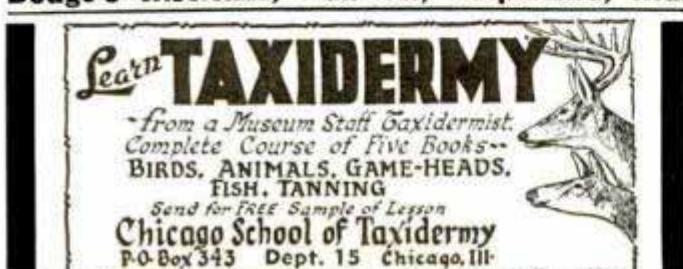
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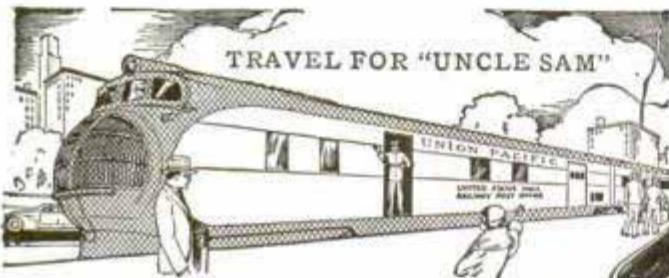
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State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, deposes and says that he is the Editor of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 337, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill.; Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill.; Business Manager, Willis S. Brown, 200 East Ontario St., Chicago, Ill.; Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Mechanics Company, 200 East Ontario St., Chicago, Ill.; Estate of Lima B. Windsor, Deceased, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; L. H. Windsor, 200 East Ontario St., Chicago, Ill.; Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. Windsor, Jr., Editor. Sworn to and subscribed before me this 24th day of September, 1939. J. GRAHAM, Notary Public. (My commission expires June 16, 1940.)

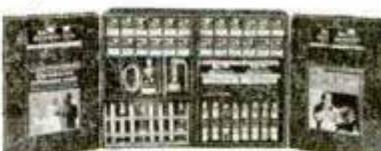
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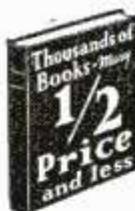
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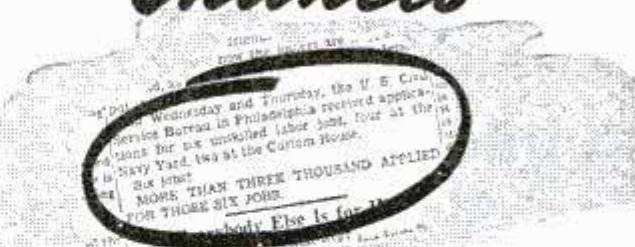
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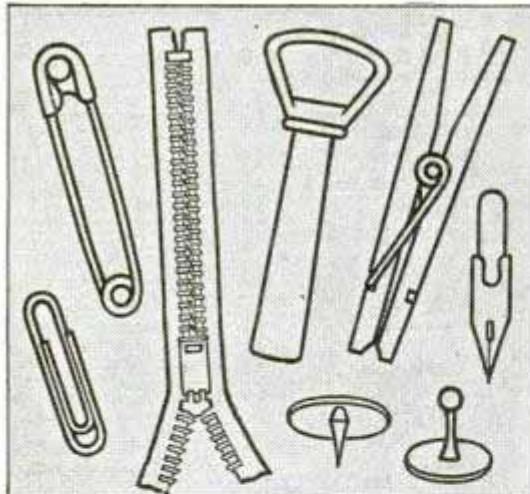
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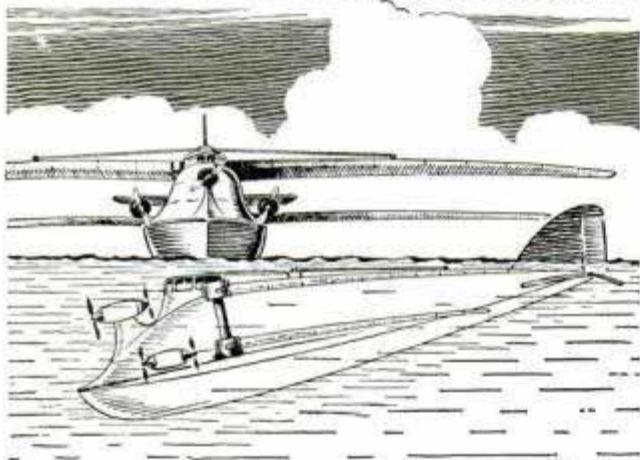
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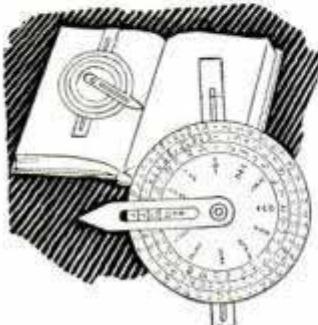
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OF PARTICULAR interest while nations are at war is a newly patented submersible aircraft which would serve the dual purpose of scouting enemy ships from the air and then diving into the water and torpedoing them. The craft would have wings which could be folded against



the hull during operations beneath the water's surface. The power plant would turn propellers for operations in the water and air screws in the air. In theory, the craft would be a flying boat, taking off and alighting on the water. When its commander desired to dive, the wings would be folded, the hull made watertight and machinery adjusted for submarine work.

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(Continued to page 24A)

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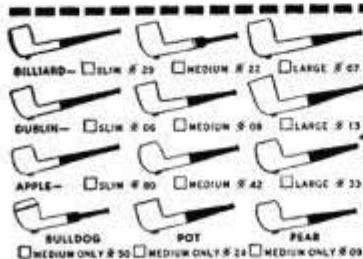
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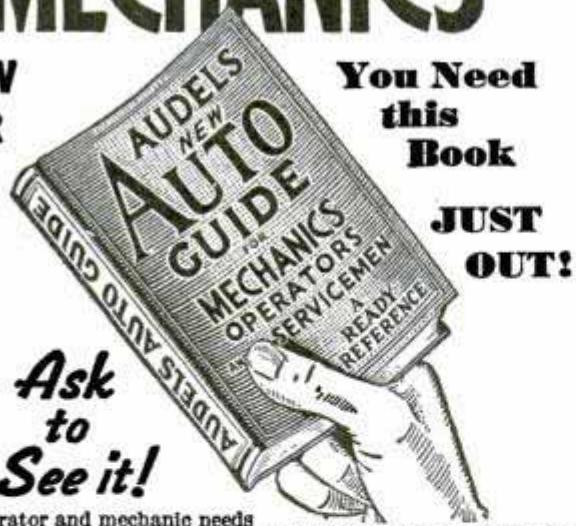
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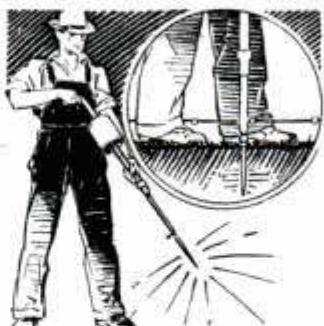
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193 POPULAR INVENTIONS

(Continued from page 22A)

HANDY for the gardener is an anti-weed gun patented recently. It may be used for spraying in open air to kill plants above the ground; then it may be employed to attack the roots of weeds by forcing its point to the desired depth in the soil

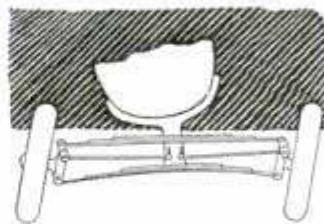


and depressing the pump plunger to apply poison chemical. The gun weighs eight pounds and holds a gallon and a half.

LOWERING a disabled plane to the ground by parachute is not a new idea, but a recently granted patent indicates that inventors are hard at work on the problem of preventing crashes. The latest invention in the field calls for attachment of a parachute to the plane, with a guide tube on each side of the fuselage for opening or closing the chute. In an emergency the chute would be spread quickly by means of operating cords.



FOR taking curves smoothly, a newly patented device permits banking of the wheels without altering the horizontal position of the automobile's body. It consists of a pair of spread-apart axles com-



plete with leaf springs and connections for controlling the action without danger. The wheel banking device might be especially useful in auto racing.

Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.

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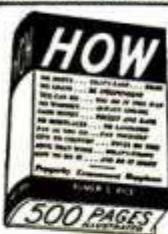
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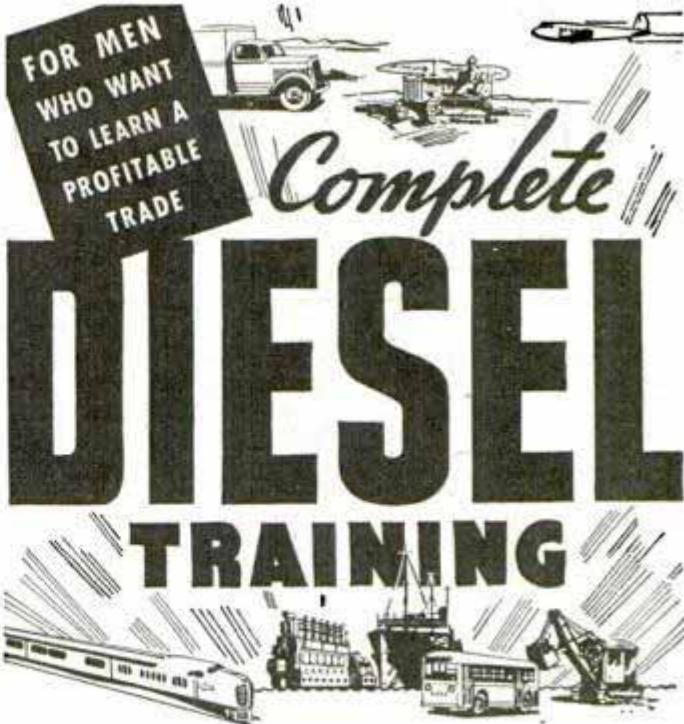
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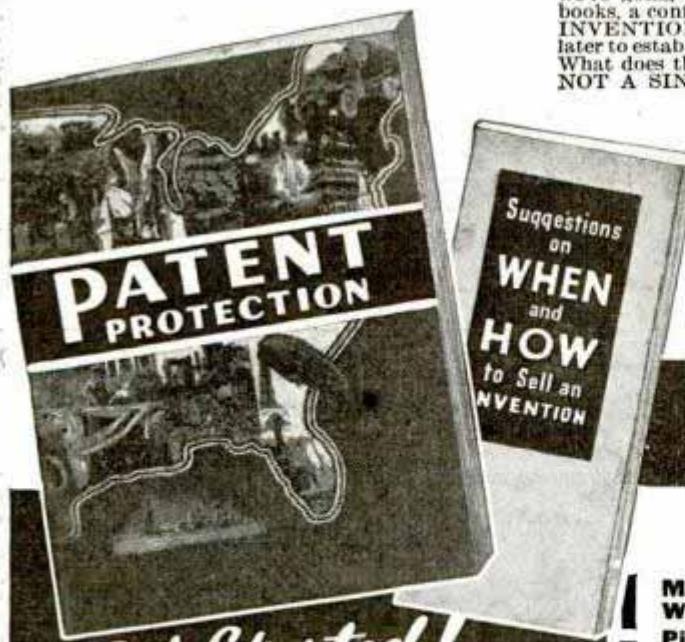
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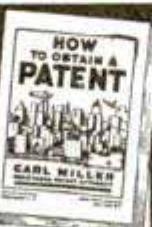
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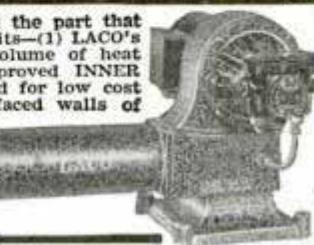
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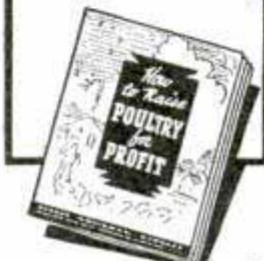
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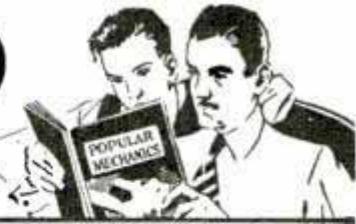
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RIOT Of colors packet includes 2 large multi-colored Ecuador Constitutions, 3 Philippines (Rizal), 3 beautiful triangles, plus stamps from Andorra, Monaco, Senegal, Ivory Coast, Futuna, Angola, Estonia, Oceanica, Tunisia, Ukrainia, Cape Verde, Kouang Tcheou, New Caledonia, Victoria. This bizarre assortment of over 20 different stamps containing pictorials and commemoratives will be given as a premium to collectors who send only 5c for our big value 100 different packet. McLoughlin, North Ave., Meriden, Conn.

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50 STAMPS Free with approvals. Leo, 853 North Martel, Los Angeles, California.

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NUDE Duchess (Spain), Hindenburg zeppelin, 5c approvals. Shultes, Berne, N. Y.

UNPICKED Mixture: 40c pound. 100 U. S. revenues on documents—10c! (700-50c.) Vanvoorthis, Hyndman, Penna.

GAMBLE. Huge auction purchases broken into \$1.00 lots. Enormous value. Worldwide testimonials. Hughes, Queens Rd., Bournemouth, England.

21 FRENCH Colonies, pictorials, sets of 5 each (105) for 35c. French, 241 Euclid, Cleveland.

MAKE Money selling stamps. Erickson, 736 Cottage, Saint Paul, Minnesota.

50 FREE Iraq, Iran, etc. Postage 1c. Album 3c. Bullard, 268 Northampton, Boston, Mass.

ATTRACTIVE Wholesale approvals. References. Fuld, Dickmann Building, St. Louis, Missouri.

BEAUTIFUL Roumanian packet, 3c. Approvals. Ward, Box 592, Vancouver, Wash.

YEMEN—5 Varieties 5c with approvals. LeDuc, Saint Petersburg, Florida.

RUSSIAN Mint set free with price-lists. Lester, 1214 N. 8th St., Philadelphia, Penna.

1199 DIFFERENT Stamps postpaid \$2.00. Ace, 5403 Beaman, Dallas, Texas.

PRECANCEL Approvals, 5 different presidents for 3c to applicants. Gierhart, Baltimore, Ohio.

MEXICAN Revolution issue and 100 foreign stamps 3c approval applicants only. Quality Stamps, Englewood, Colorado.

1000 MIXED Foreign 25c. Well worth sorting for values. Plaza Stamp Co., Santa Fe, N. Mex.

MEXICAN Dollar bill and 100 different foreign stamps 10c. Nagles, 346 North 12th, Reading, Penna.

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U. S. mission mixture. 50c pound. Stamps, Box 64, Racine, Wis.

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STAMP Catalogue free! New revised edition. Giant fifty-page quarterly listing albums, supplies, Canadians, Newfoundland, United States, new issues, foreigners and pictorials. Illustrations galore! Empire Stamp Company, Dept. PM, Toronto, Canada.

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10,000 MONEY-MAKING Formulas, secrets, recipes for making almost anything. 900 page book \$1.50 postpaid. Catalog 3c. Adams-Brown Company, Chestnut Hill, Massachusetts.

CHAMPION Wall paper cleanser. No water hand soap. Mending fluid. All three formulas \$2.00. Mack McLeod, West Branch, Mich.

DON'T Buy formulas before reading November's big free Formula Messenger! Miller's Chemical Laboratories, Tampa, Florida.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

3 GOOD Formulas with instructions for making gold, silver, gun-metal mirrors, \$1.00. Don't buy cheap formulas. Nashville Mirror Plating Co., 427 Broad, Nashville, Tenn.

FREE Formula catalog. You'll be surprised. Western Chemical, Salem, Oregon.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Avenue, Syracuse, N. Y.

FORMULAS For live selling products. Palmer Specialties, Sandwich, Ill.

THAXLY Formulas for perfect products. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

FORMULAS—All kinds. Real money-makers. Lowest prices. Catalog free. Clover Formulary, P-12, Niles Center, Ill.

CHEMISTRY

FREE Catalogue. Chemistry, mineralogy, biology, microscopes, telescopes. Tracey Laboratories, Evanston, Illinois.

CRUCIBLE Amateur chemical magazine. Sample copy 10c. Crucible, Box 294, Jamaica, N. Y.

CHEMICAL. Electrical, technical books. Catalogue. Stamp. Kraftsmen's Press, Cos Cob, Conn.

LEARN Chemistry: 40-lesson course \$10, formerly \$145. Money-back guarantee. Particulars free. Lawes, 128 E. 23rd, New York.

CHEMICALS. Laboratory, glassware, apparatus. Send 3c for catalog CPI. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

SPECTROSCOPE For quick chemical analysis \$2.50. Kutting Sons, Campbell, California.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

HELP WANTED

BIG Money taking orders: shirts, ties, hosiery, underwear, pants, jackets, raincoats, uniforms, etc. Sales equipment free! Experience unnecessary. Nimrod, 4922-BG Lincoln, Chicago.

STEADY Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 329, Freeport, Illinois.

M. M. Earned \$267. three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United. 3848 Lincoln Ave., Dept. 63. Chicago.

SALARIED Positions—\$2500 yearly and up. Let us find one for you. Write for valuable information. Executive's Promotion Service, (16), Washington, D. C.

\$30 WEEKLY Grow mushrooms. Cellar, shed. We buy 35c lb. Mr. B. made \$270 spare time. World's largest company of its kind. 40 page book free. Mushrooms, Dept. 701, 2019 Second, Seattle, Wash.

AGENTS WANTED

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, S-37, Greenfield, Ohio.

SELL The best fibre house broom made; new low prices; 100% profit. Fibro Brush Mfg. Co., 1268 Stanford Ave., St. Paul, Minn.

500% PROFIT With new perfected (1940) quick-action, no flint, automatic gas lighter. Retails 25c. Sample 10c. New Method Co., Box PMH-83, Bradford, Penna.

WORLD'S FASTEST MONEY MAKER. Sell 50c packs of razor blades for 5c. Tharp, 914 Lexington, Cumberland, Md.

MERCHANTS Wall signs. Cost 1c, sell 10c. Samples 15c. Richards, 127-M E. New York St., Indianapolis.

NOW—Direct factory representatives wanted. New profit plan on nationally known, guaranteed electric refrigerators. Write today. Gennett and Sons, Dept. C, Richmond, Indiana.

WANTED—Distributors, jobbers, for attractive carded merchandise priced right. Aspercol Products, 2613-15-17 38 Ave., Oakland, Calif.

SELL Artistic oil painted personal portraits. Portraiture, 2637 Evergreen, Chicago.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, rain-coats, uniforms, etc. Sales equipment free! Experience unnecessary, Nimrod, 4922-AN Lincoln, Chicago.

"KEENEREDGED" Blades shaves smoother. Guaranteed sample "Keeneredger" \$1.00. Keeneredger, Oblong, Ill.

MAGNETIC Sponge draws dirt from clothing. Used like brush. Saves dry-cleaning. Slick discovery. Samples sent on trial. Write "Inventor," 113 Kristee Bldg., Akron, Ohio.

AGENTS—300% Profit selling gold leaf letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

SURE-FIRE Deal. Housewives grab it. \$1 household necessity, now 69c. Give genuine Delfite salad bowl without charge. Big profit for you. 200 other fast-sellers. Free to reliable man—\$6 worth goods to start. Zanol, 6138 Monmouth, Cincinnati, Ohio.

POLMET Polishing cloth removes tarnish from metals without the use of liquid, paste or powder. Agents say it sells like "hot cakes." Retails 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

STEADY Profits: New improved wax furniture polish. Private brands: your name. P.O. Box 247, Newport, R. I.

AGENTS—Opportunity make money; book containing 127 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

MAKE Extra money selling new plastic beverage bottle cap every home uses. Send 15¢ for sample. Metalo-Plastics, Inc., Port Washington, N. Y.

DANDY Seller. Good profits. Details free. Societe Cent Quarante, Valley City, N. Dak.

BUSINESS Proposition resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write Sprinkle, Plater, 128, Marion, Indiana.

CAR-OWNERS To put up our signs. Fine offer for anyone traveling. (Not for kids.) Get details. Atlas Sign Works, 7941 Halsted, Chicago.

AUTOMOBILE Mechanics who want business or earn extra money write for samples and details of nationally distributed Self-locking Triple-X Piston Rings. Eliminate re-boring. Guaranteed life of car. Franchise valuable. Some territories open. Triple-X Co., 3801 South Racine, Desk RA, Chicago.

WANTED—Purchasing agents, no experience or money required, write and mail 3c stamps for application to Purchasing Mgr., 176 N. Halsted St., Chicago.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. L-53-PPM, Freeport, Ill.

205 WAYS. Start own moneymaking business. Select line not overcrowded. Particulars free. Stamford, 3762-b Broadway, New York.

FOREIGN Like souvenir auto plates. China, Egypt, India, \$1. Agents wanted. Lingles Shop, Dept. PM, Anna, Ill.

EXCELLENT Sparetime profits taking subscriptions—2500 magazines. Confidential agents catalogue, complete starting supplies free! Pines, A-581 Monroe, Brooklyn, N. Y.

SELL New used clothing from home, auto, store. Men's suits 96c. Overcoats 66c. Dresses 21c. Ladies coats 42c. Hundreds big bargains. Catalog free. S&N, 440-A East 31st, Chicago.

NEW 10c Seller. Costs 1c. Western, 432 Climax Bldg., Cleveland, Ohio.

EX-O-LENE Anti-knock power compound. More mileage, power, speed, pep guaranteed. Thermo Exolene, Peoria, Ill.

READ Our war and oil ad under Business Opportunities, it's worth answering. Royal Keystone Enterprise, Box 192, Berryville, Ark.

TIES: Wonderful proposition. Free swatches. Eureka, 307 West 38th, Manhattan.

SELL Fascinating Jitterpups and carded merchandise. Dixie Supply, Rosslyn, Va.

FAST Selling perfume novelties. Big profits. Vassar, 332-P Washington, Hoboken, New Jersey.

AMAZING Manufacturing formula. Fast selling repeater. Make at home. Large profits. Complete selling plans. Details free. Shennery Laboratories, 1788 Madison, New York.

MOTORS: Drills; appliances; grinders. Mailorder Electric, 715 South Dearborn, Chicago.

\$ FOR Your spare time! No investment! Experience unnecessary! New items! Tremendous sales appeal! Buyers everywhere! Convince yourself! Deluxe outfit free! Union Specialty, 1775-P Broadway, New York.

MEXICAN Curios sell on sight. Large profits. Free particulars. Samples 10c postpaid. Marquez-PQ, Apartado 1176, Mexico City.

EARN Extra money taking magazine subscriptions. Lafayette Agency, Sea Cliff, N. Y.

WAR MAPS—24x36 pictorial. Big profits, easy sales. Sample 25c. Premium Promotions, 1181 Broadway, New York City.

AGENTS Wanted. "Magic Box." Fast seller. Sample 30c. Money refunded if not satisfied. Speedy Specialty Co., Box 184, Venice, Calif.

SENSATIONAL Device cuts, trims own hair. Also manufacturing formulas. Plaza Laboratories, T, 1561 North Clark, Chicago.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

500% PROFIT. Gold and silver colored sign letters. Offices—stores. Large sizes. 1c. Free samples. Modernistic, B-3000 Lincoln Ave., Chicago.

DRESSES 10c. Hats 40c. Shoes 50c. Many other bargains—Used merchandise. Free catalog. Send name on postcard. Fairmount, 160PM, Monroe Street, New York.

SELL 50 Assorted Christmas cards with name \$1. Costs 50c. Free sample offer. Other profitable sellers. Nickel's Press, 4617 Loughborough, St. Louis, Mo.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-T Dodier, St. Louis, Mo.

COLLECT Your bad debts. Merchants write Lamont Company, Beacon, New York.

500% PROFIT! Transfer sign letters for windows, offices, trucks, signs. Colors: gold, silver, red, many combinations. Auto monograms. Easily applied. Neonite, Akron, Ohio.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, PO, St. Louis, Mo.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

SUCCEED With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxby Company, Washington, D. C.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order decalcomania name plates. "Ralco," 1305 Washington, Boston, Mass.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

BIG Daily profits, extra cash bonuses. Represent large manufacturer. Show complete line tailored shirts, neckwear, hosiery, underwear direct to wearer. Experience unnecessary. Part or full time. Handsome outfit free. Write. Tell us something about yourself. Packard Corporation, Dept. F446, Terre Haute, Ind.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 10-M, Spencer, Ind.

SELL Printing at cut prices. 2,000 business cards \$1.50; 1,000 envelopes or statements, etc. \$1.75; 25 printed sales books \$1.50; 1,000 process embossed cards \$1.50; 2,000 two-color labels, free holder \$1.50; 2,500 printed handbills \$1.75. One-third comm. Free outfit. Bargain Prtg. Co., 189-P W. Madison, Chicago.

SALESMEN. Distributors, 200 items, brushes, mops, marvelous magnetic brush excels vacuum cleaner. Big profits. Neway Brush Co., Hartford, Conn.

SELL Complete line business necessities—over 1000 items. 50% savings to every merchant. Experience unnecessary. Samples free. Commissions advanced. Northwestern, 625-RM Jackson, Chicago.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

NATIONALLY Known business service. "Bad times" spell "good times" for alert salesmen. Easy seller. Repeats. A. C. L., 107 Pleasant, Baltimore, Maryland.

PERFUMES. Wholesale to stores. Pickwick, 501 Melville, Rochester, New York.

SALESMEN: America's finest sideline. 40% comm. daily, 725 fast selling repeat items. Every business uses and must buy. No investment. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. NM, Chicago.

WRITE For new free catalog fast-selling numbers, carded merchandise, razor blades, aspirin, pocket combs, etc. National Supply Company, Richmond, Virginia.

\$3,000 PROFIT In six months by Foster. Over \$6,000 in one year by Felton. Over \$30.00 daily for 90 days by D. F. F. All selling our special tool set to garages. Exclusive territory. Mesco, Beaver City, Neb.

NEW Reflector type lawn numbers. Every home owner wants one. Write now. Numberlite, Box 403, Springfield, Illinois.

ADVERTISING Book matches offer liberal earnings—full spare time. Experience unnecessary. Factory direct. Low prices for fine quality, quick deliveries, help get orders; faster repeats. All business firms prospects. Free outfit, instructions. American Match & Printing Co., Dept. 612, 4822 South Trumbull Ave., Chicago.

OPENINGS! Call on all dealers with new trade-stimulator plans. It's "hot." \$3 commission on each \$5 sale. Big repeat commissions. No investment. Sales kit free. Universal, 2222 Diversey, Dept. C512, Chicago.

CLEAR Up to \$10 daily. Offer deluxe family Bible—\$1.95. Experts say worth \$5. Average \$1 profit. Size, 8 $\frac{3}{4}$ by 11 $\frac{1}{4}$. Every home, church a prospect. Amazing value makes fast sales. Westcraft, Dept. 212, Racine, Wis.

ADVERTISING Book matches—calendars. Lowest prices. Big cash commissions. New outfit free. Gem Match, 76PM West Washington, Chicago.

LOCAL Agents wanted to earn bonus suits and demonstrate to friends. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples absolutely free. H. J. Graves, 1300 Harrison, Dept. A-817, Chicago.

AGENTS Earn 100% fast selling new style menu covers all dining places. Sample full particulars. Write Crystal-Vu Binder Company, Camden, N. J.

DISTRIBUTORS Line best auto specialties going. Small investment required. 100 South 11th, Hiawatha, Kansas.

DRESSES 10c. Hats 40c. Shoes 50c. Many other bargains—used merchandise. Free catalogue. Send name on postcard. Fairmount, 162PM Monroe Street, New York.

CALENDARS—Beautiful complete line, all sizes, including jumbos. Samples free. Also Christmas cards. Fleming Calendar Company, 6539 Cottage Grove, Chicago.

EARN 65c On every dollar! Sell Christmas twenty-one piece superfine, religious or magicard assortments. Three sample boxes \$1.00 postpaid. Personal imprint Christmas folders, wreaths, wrappings, calendars. Illustrated circular service. Popular sellers! Catalog free! Elfko, 440 North Wells, Chicago.

BLADES. Finest quality. Factory prices, postpaid. Ace Blades, Buffalo, N. Y.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

EDUCATIONAL AND INSTRUCTION

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AIR Conditioning—Electric refrigeration. Rapid growth creates big demand for trained men. Earn up to \$35-\$50 weekly. Write for free facts. Utilities Engineering Institute, 404 North Wells, Dept. 19Z, Chicago.

SELLING Real estate brings largest commissions. Open own office. Learn how through home study in easy lessons prepared by real experts. Entire course only \$10.00. Morrison School of Real Estate, 100 N. La Salle Street, Desk 9, Chicago.

EARN More—Improve yourself—Learn bookkeeping. Only \$1.00 for up-to-date, interesting, self-instructive book. M. J. Butler, Publisher, 6709-D Cregier, Chicago.

YOU, Too, can have your own profitable, lifetime business. Operate a collection-credit bureau. Capital unnecessary. Free literature. Cole Associates, Syracuse, N. Y.

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INVENTIVE Minded can become independent! Explanation free. Don Higbee, Cantil, Calif.

ELECTRIC Welding pays good money. Jobs everywhere. Our short course trains you. Write for information. Welding Company, 4100 Paul Street, Philadelphia, Penna.

WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., M-2001 Manhattan Building, Chicago.

BECOME Practical scientific investigator. Modern illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, PM-129, Hoboken, N. J.

GET A government job. Men-women, \$105-\$175 month. Prepare immediately for examinations. Full particulars, free. Write today. Franklin Institute, Dept. T3, Rochester, N. Y.

HOME Study and degree—Psychology, Metaphysics, Bible, Philosophy. Free catalog. College of Universal Truth, 20 East Jackson, Chicago.

MATHEMATICS. Arithmetic, algebra, geometry, trigonometry, calculus, sciences, engineering, accounting, statistical, actuarial mathematics. Mondell, Institute, 230 West 41st, New York.

LEARN Watchmaking. Material to start \$1.00. Wholesale tool-material-watch catalog 5c. Instruction book \$3.50. Stewart's, 121 Olive, St. Louis, Mo.

BIG Pay trades you can learn in a few weeks. Decorating, paperhanging, graining, marbling, card writing. Enroll now. Booklet free. Chicago Painting School, 102 West Lake Street, Chicago, Illinois.

CIVIL Service examination books. Postal \$2.00, storekeeper-gauger \$1.10. No experience required. Many others. Free information. Write today. Pergande, Publishers, Milwaukee.

YOU, Too, can have your own profitable, lifetime business. Operate a collection-credit bureau. Capital unnecessary. Free literature. Cole Associates, Syracuse, N. Y.

LEARN Electricity in 25 weeks. Complete course \$12.95. Details free. Radcliffe's, 1015 High, Petersburg, Virginia.

DRAFTING Jobs often pay \$175.00-\$500.00 month. Qualify now. Complete details free. Write today. Monroe Institute, PM-12, Alton, Illinois.

WRITE For newspapers—gain pleasure, good pay and perhaps fame. Full time or free-lancing (part time). Hundreds of stories, articles, ideas are needed in every issue. We successfully coach you by mail. 45 years newspaper experience—plenty of contacts for placing graduates. The Millers, Dept. 10, Bakersfield, Calif.

HIGH School French, English, expert mail tutoring, exam coaching; details, stamp. V. Doherty, 4821 47th, Woodside, N. Y.

DRAFTING, Blueprint reading, architectural, airplane, mechanical, electrical, naval architecture, structural. Mondell Institute, 230 West 41st, New York.

READ Our war and oil ad under Business Opportunities, it's worth answering. Royal Keystone Enterprise, Box 192, Berryville, Ark.

HOW To secure a gov't job in the classified civil service. Railway postal clerk, \$1900 a year. Postal clerk, city mail carrier, \$1700. Other jobs, \$1260 to \$2100. Our method helps you pass exams. Men-women, age 18 to 50. Send for free book. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

LEARN Air conditioning—America's next big industry. Thousands of opportunities. Get your start with complete book by E. W. Riesbeck. \$3.50 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

MASSAGE, Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

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SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

BOY Mechanic—Famous library of 3 volumes covers the building of almost everything a boy might want to make. Actually covers 3,000 different articles. Each volume 460 pages, fully illustrated. Cloth. Price \$2 each or set of 3 vols.—\$5 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

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MAKE Money writing for radio. Stamp brings details. Writer, 2265 Delaware, Buffalo, N. Y.

AMBITIOUS Student-poets expertly trained. Publicity help. Romatka, 25 West 3rd Street, New York.

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BE A writer—"Writer's Handy Guide" just out tells how to write—where to sell, \$1 postpaid. Manuscripts edited, revised, typed. Jewel Guild, 330 S. Wells, Chicago.

SHORT Stories revised, typewritten, marketed. Hursh, Box P-1013, Harrisburg, Penna.

RADIO, Stage plays wanted for publication. Readings free. Details, Box 42, Kenmore, N. Y.

ORIGINAL Poems, songs wanted for publication, radio. Westmore Music Corporation, Dept. 33G, Portland, Ore.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

BE A professional sign writer right from the start with Showcarder. No training necessary. Make signs that sell. Write Showcarder, 52½ North Prior Avenue, St. Paul, Minnesota.

HAVE Your own money making business. Learn show card writing, sign painting. Write for details. Begley Specialty, 1472S Broadway, New York.

QUICK Method sign painting. Particulars 10c. Straley, 1017 Mulberry, Springfield, Ohio.

CARTOON Sales Guide monthly. Two issues 25c coin. Lavalette, W. Va.

LEARN Chalk talking. Quick easy method \$2.98. Marland Haines, Bloomfield, Indiana.

LEARN Cartooning, lettering, etc. Free information. Murray Service, 1799 East 100th, Cleveland, Ohio.

ANIMATED Cartooning taught days, evenings. New York state licensed. Mondell Institute, 117 West 42nd, New York.

AMATEUR Cartoonists, earn cash at home, copying and duplicating cartoons for advertisers. Ad-Service, Argyle, Wis.

ART For advertisers! Drawings, lettering, etc. Gill Art Service, Huntsville, Alabama.

LETTERING Patterns, free literature. Sample alphabet 5c. Display Letters, Box 28, Ft. Hamilton, Brooklyn, N. Y.

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including drawing paper, pens, pencils, \$1.00 complete. Fraba Service, Cashton, Wisconsin.

PEN And ink drawings. Let us draw your advertising and catalogue illustrations, from photos, copies or objects. Best work and fair prices. Heraldic Studios, 1914-P Oakdale Avenue, Chicago, Ill.

MAKE Art Pay. Advanced art students. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

LEARN Advertising at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3439, Chicago.

INCH Display advertisement 30 magazines, year \$24. Wood's Popular Services, Atlantic City, N. J.

ADVERTISE Profitably: \$15 reaches 5,000,000 Sunday newspaper readers with 24-word ad. Newspaper, magazine, mailing-list ratebook, free. Chicago Advertising Agency, 20-PA West Jackson, Chicago.

ADVERTISE: 24 Words, 149 newspapers \$6.50. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

FOUR-LINE Ad, 185 newspapers, \$5.28. Lists free. Fidelity Advertisers, W-3838 Washington, Chicago.

INCH, 3 Times, 50 magazines, \$3.00. Albert Service, 6-M North Dearborn, Chicago.

ADVERTISE: 24 Words, 200 newspapers, \$5.72. Lists free. Midwest Advertising Agency, Columbus, Ohio.

DIRECT-MAIL Advertising services. Sales letters that sell. Mailing lists. Omaha List & Letter Co., Box 2172, South Omaha, Nebr.

ADVERTISING Placed all magazines, newspapers, radio. Lowest rates. Free service. \$4 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

BUSINESS SERVICE

LOS ANGELES Address. Daily forwarding, contacts made. Information furnished. \$1.50 monthly. Universal, 2808 - 12th Ave.

NEW YORK CITY, mail address: business, personal; forwarded; \$2 monthly. Wiesen, 151-M West 40th.

RUBBER STAMPS AND OFFICE SUPPLIES

2 LINES 25c. 3—35c. Cushioned. Stamp Works, Centerport, N. Y.

ORIGINAL, cushion mounted. One, two lines, 25c; three 35c; four 45c; facsimile signatures \$1.50. Stamp Works, 814 Bradley, Peoria, Ill.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Nebr.

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MULTIGRAPH. Large, automatic, printing model. \$125.00, with Davidson \$175.00. 8041 Exchange, Chicago.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302-A, Altadena, California.

TYPEWRITERS. Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Pruitt, 28 Pruitt Bldg., Chicago.

OFFICE Machines, typewriters, adding machines, duplicators, etc., 29 different makes, care and operation of. Only book on subject. 384 pp. illus. \$2.50 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

500 REGULAR Letterheads, envelopes, statements, billheads \$1.00. 5000 \$7.50. Carter, Box 52, Orange, Calif.

1000 BUSINESS Cards—Vellum or thinplate \$1.50 postpaid. Complete sample folio for stamp. Thornber Press, 2166 Sixth, San Diego, California.

40 CHRISTMAS Cards, 250 envelopes, letterheads, 95c. Samples, illustrations. Schneider, 949-B West 68th, Chicago.

LETTERHEADS, Envelopes, 125 each \$1.00 postpaid. Smith Printery, Hollandale, Wisconsin.

200 8½x11 BOND Letterheads, 200 6¾ envelopes \$1.00 postpaid. Franklin Printery, 2932 Pershing, Chicago.

125 8½x11 TWENTY POUND bond letterheads and 125 6½ envelopes \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

MULTIGRAPHING—500 Letters just as if typewritten. \$1.70 (20 lines). Multigraphers, Ashland, Virginia.

COMBINATION Special—500 Hammermill letterheads, statements, envelopes, \$4.00. Also personal stationery. Adkins, Union, N. Y.

1,000 TWO-COLOR Shipping labels, 4x2½—\$1.75. 10,000 3x6 circulars, \$4.95. Letterheads, envelopes, typewritten letters, cards, etc. Okayprint, Martins Ferry, Ohio. Samples.

50 SHEETS, 20 Envelopes, 25c postpaid. Western Stationery, Topeka, Kansas.

1000 NEAT Business cards \$1.00 postpaid. Taft Co., Box 5366, Chicago.

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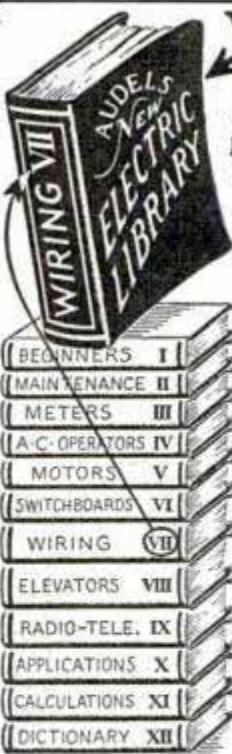
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20TH ANNIVERSARY SPECIAL!****PUT THIS 1940
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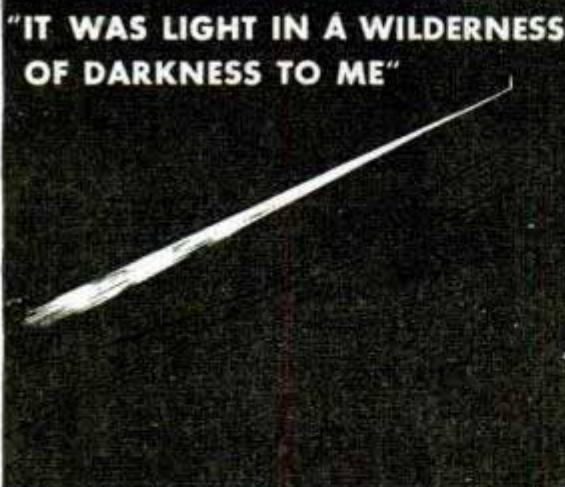
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Send me for ten days' examination the new American Machinists' Library. If satisfactory I will send you \$1.50 in 10 days and \$3.00 monthly until the price of \$16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

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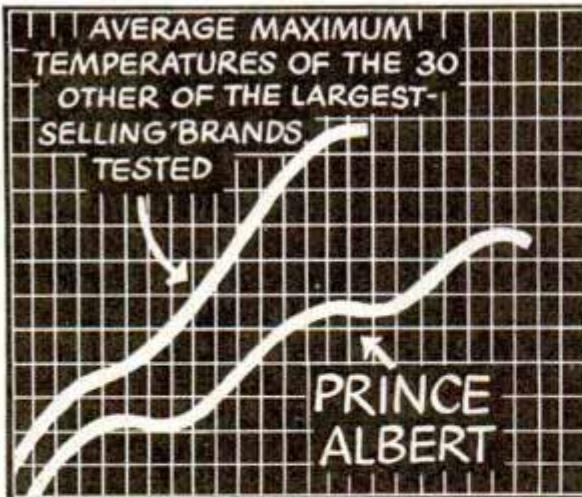
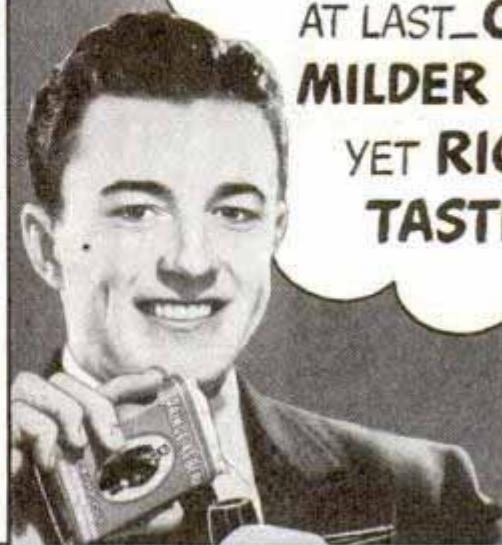


Chart showing how much cooler Prince Albert burned compared to the average of the 30 other of the largest-selling brands recently tested for cooler smoking

I'M
GETTING REAL
SMOKING COMFORT
AT LAST—COOLER,
MILDER SMOKES,
YET RICHER-TASTING!



In Recent Laboratory "Smoking Bowl" Tests, Prince Albert Burned

86 DEGREES COOLER

than the average of the 30 other of the largest-selling brands tested
—coolest of all!



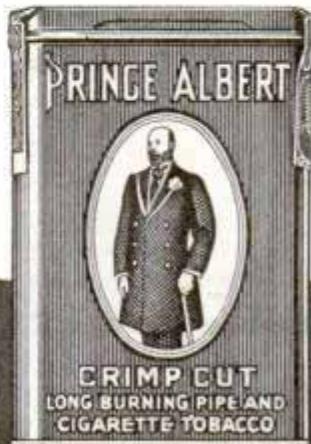
SCIENTISTS at a nationally known independent laboratory tested to find the COOLEST-SMOKING TOBACCO, and the results are no surprise to millions of smokers. Automatic smoking and heat-registering machines found that Prince Albert smokes coolest—as above. Say good-bye to parching, "bitey" smokes. P.A.'s cooler, milder smoking lets rich, full body come through EXTRA EASY ON THE TONGUE. Prince Albert's choice, "no-bite" tobacco is "crimp cut." ("Makin's" fans, that's a "pointer" to you too!)

OL' JUDGE ROBBINS SAYS:



LET COOL-SMOKING P.A.
PUT NEW JOY
IN YOUR PIPE!

50
pipefuls of fragrant tobacco in every handy tin of Prince Albert



Copyright, 1939, R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

Prince Albert

THE NATIONAL
JOY SMOKE

Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 72

DECEMBER, 1939

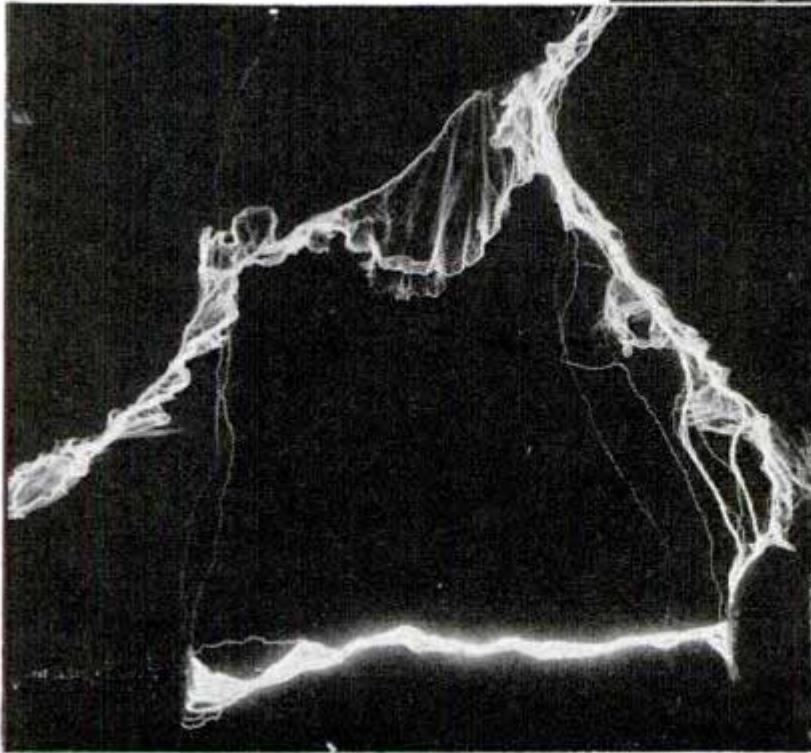
No. 6

TREASURE HUNTING UP-TO-DATE

By L. A. Hawkins

Executive Engineer,
General Electric Research Laboratory

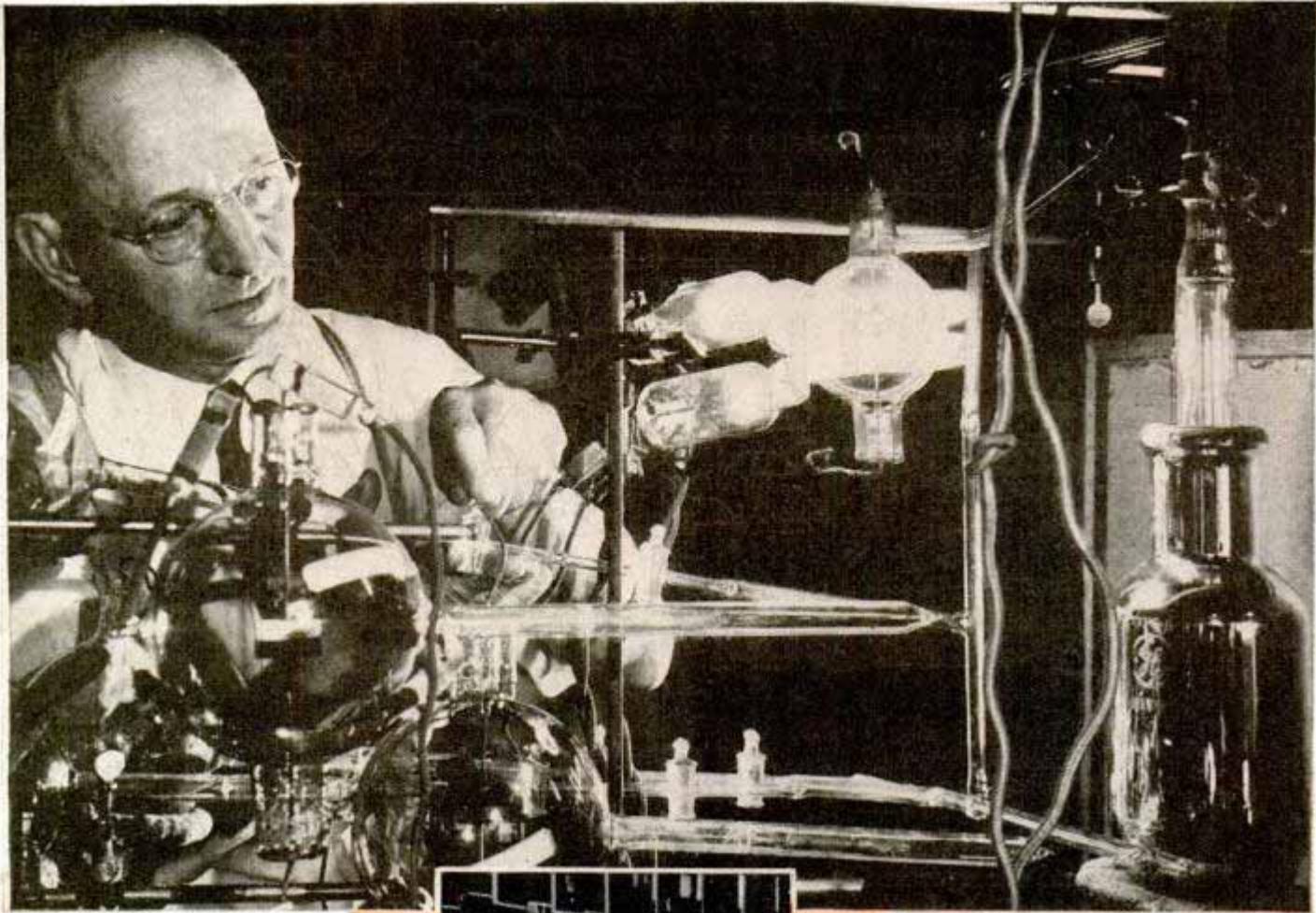
A MERICAN industry has undergone profound changes in the past fifty or sixty years. Automatic machine tools have increased productive efficiency enormously; standardization and mass production have become the rule, yielding superior products at far lower costs; the role of engineering has



While engineers put electricity to work, researchers try to find what it is and why it behaves as it does. Above, studying an arc; left, a camera "freezes" lacy pattern of nine-foot arcs between revolving pinwheels

9/11/2

William A. Dugdale



Man's nearest approach to perfect vacuum is removal of all but one ten-billionth of air in X-ray or radio tube, above. Center, scientist watches activities in one of the new bulbs. Bottom, million-volt X-ray machine

increased greatly in importance and has led to a much higher degree of technical specialization.

But no other change is likely in the long run to have a profounder effect on the character of industry than that which is being wrought by industry's domestication of science in its own research laboratories.

This change began less than forty years ago and came into wide operation only in the last two decades. It is since the last war that research has become generally recognized as an essential function of industry.

Scientific facts are the basis for invention and engineering development, but



the inventors and engineers of the last century had, as their only source of such facts, the sporadic results of unorganized researches. But even so, the experiments of scientists, working single-handed and often with the most meager equipment, had laid the foundations for a number of new industries, of which none was growing more rapidly and promising more for the future, as the century closed, than the electrical industry.

It was Faraday's great discovery of electromagnetic induction in 1831 which made possible the development of the generators, transformers and motors with which in "the gay nineties," the young profession of electrical engineering was building its rapidly growing systems for the generation,



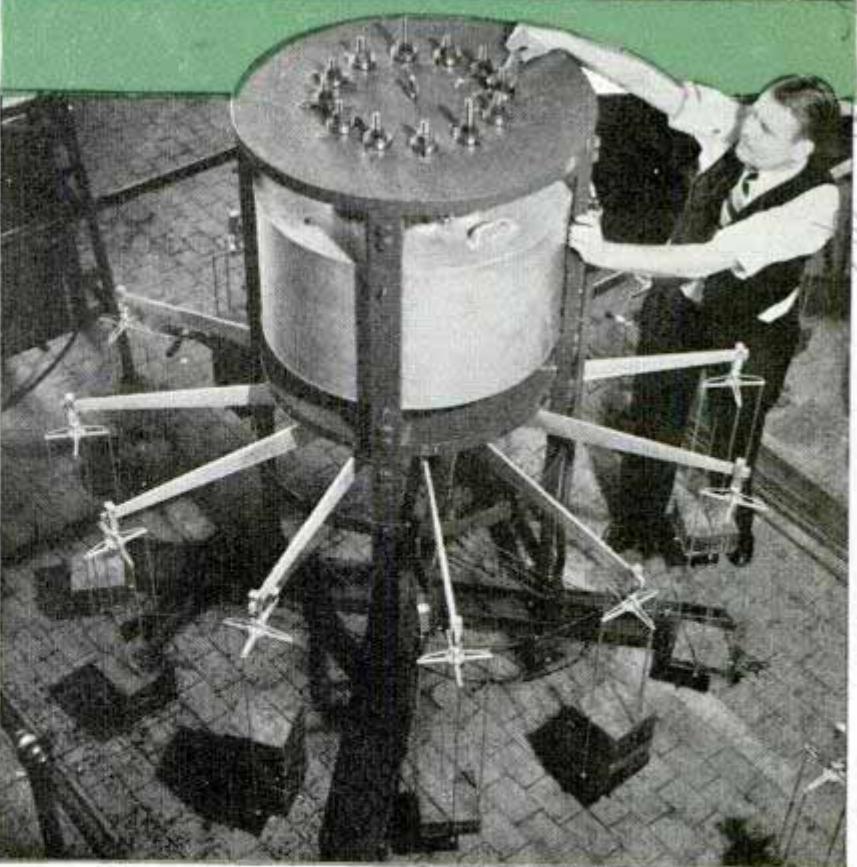
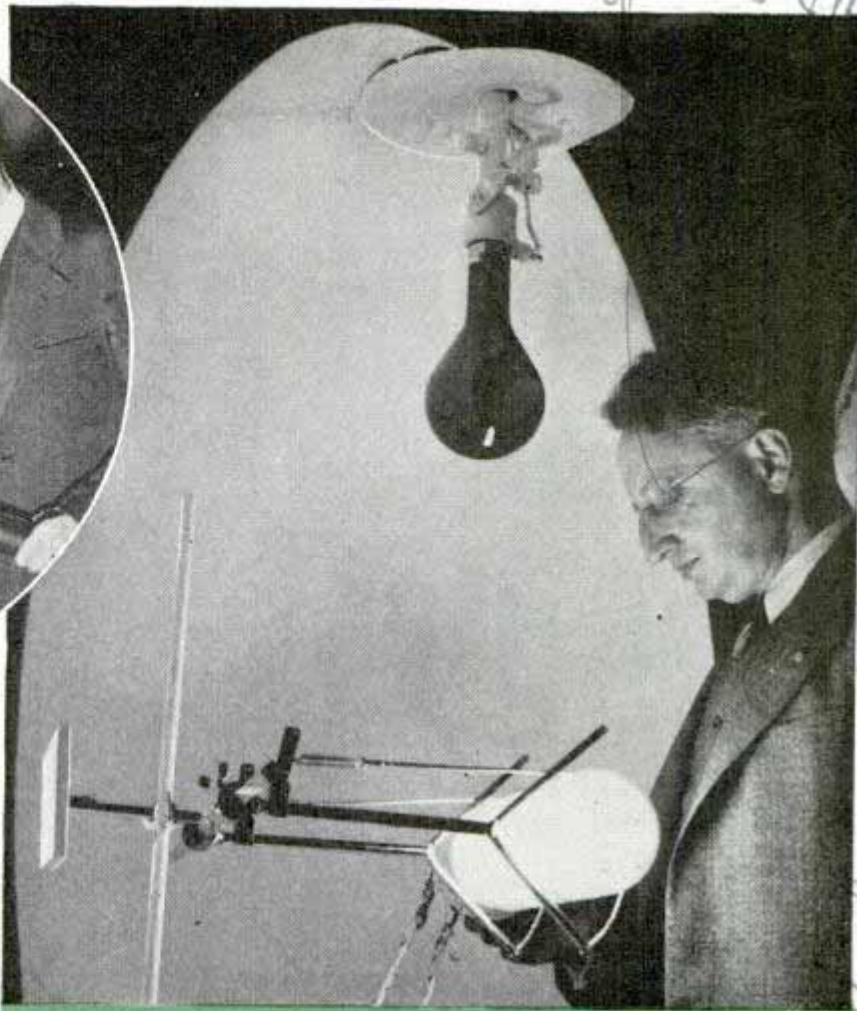
distribution and utilization of electric light, heat and power.

Some of the industry's leaders had the vision and wisdom to perceive that if such important development had sprung from sporadic scientific efforts in the past, much more could be expected from organized, cooperative endeavor, adequately supported with equipment and material. To this perception the industrial research laboratory owed its creation.

The General Electric company was a leader in this movement. Its research laboratory was started in 1900. Today the National Research Council lists 2,000 industrial research laboratories.

Research is the systematic search for new facts by experiment, but research is of two kinds. One kind seeks new facts about a particular thing for a definite end. It is such research which leads to new and better materials, new, improved and lower-cost products, increased productive efficiency, new or

(Continued to page 150A)



Top, left, inspecting high-power X-ray tube; right, measuring light output of sodium-vapor lamp. Bottom, twelve steel rods for turbines are given breakdown test in an electric furnace

Cup Is Kept from Skidding by "Well" in Plate



Cup sits tight in "well" of non-skid glass plate even when it is tilted at sharp angle

If you experience difficulty in balancing a plate and cup on your knee at those informal luncheons, you may welcome a plate that permits one-hand control of the food and beverage. Skidding of the cup is prevented by a "well" rising in the center of the glass plate into which either a cup or tumbler will fit.

Sound System for Home Movies Carried in Compact Case

Sound effects and music for home-movie presentations are available in a three-in-



Loud speaker is in upper part and amplifier below

*4928 Newton Ave.
Minneapolis*

one unit which includes dual turntables, amplifier and loud speaker built into a portable carrying case weighing less than forty-five pounds. The speaker and a fifty-foot extension are contained in the upper portion of the case, and there is space for a microphone and small stand. Either ten or twelve-inch disks may be played. Pick-up arms are equipped with pilot lights to aid in finding record grooves in darkened projection rooms. For split-second synchronization of sound effects, push-button cutoffs are provided.

9/10/50

Portable Drinking Fountain Holds Five Gallons

More sanitary than the old-fashioned water jug is a portable drinking fountain



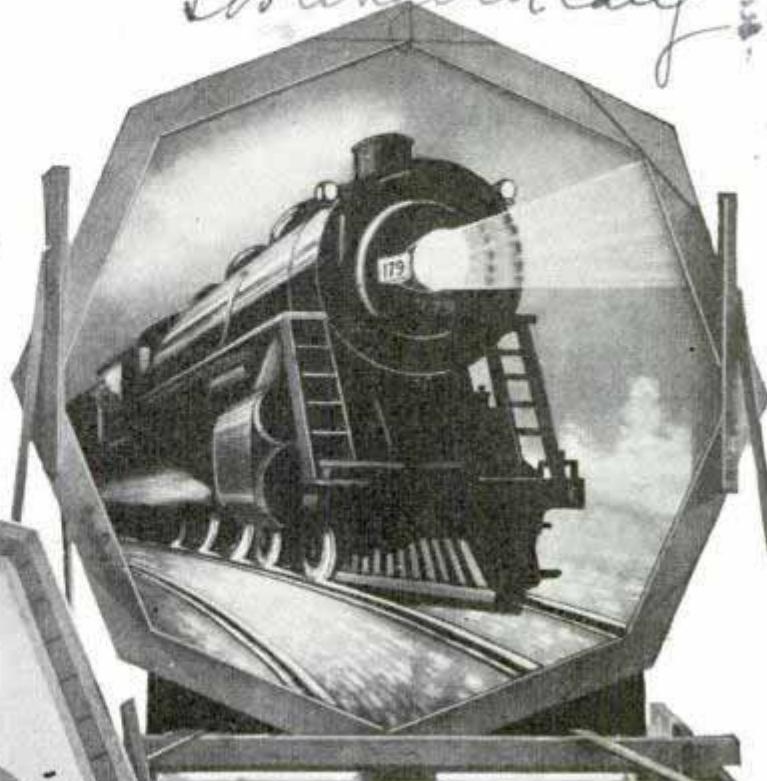
Portable drinking fountain replaces the old water jugs at athletic fields and construction jobs

that has the appearance of a fire extinguisher. A few strokes of the pump build up enough air pressure in the compression chamber to force water out of the fountain when the valve is released. It holds about five gallons and ice may be added to the water if desired.

*Hobbs Mfg Co
North St. Paul, Minn.*

Cylinders Impart Motion to Scene on Sign

Motion is imparted to advertising signs by illuminated cylinders revolving behind them. The scene itself is painted on Lumarith, an acetate cellulose plastic material which passes light, in back of which is slipped a shield to mask the part of the picture not to be animated. Also made of Lumarith, the cylinders have designs painted on them and synchronized to create natural action in the



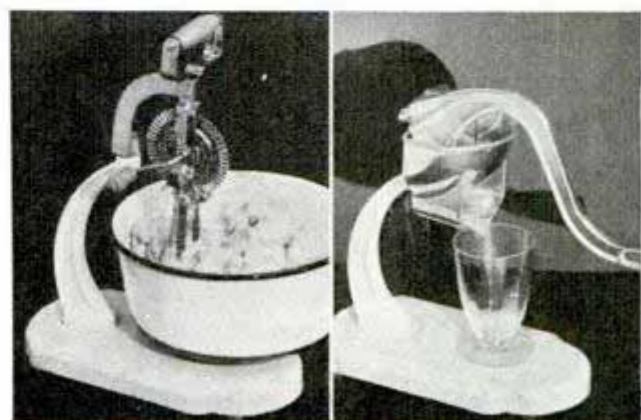
Left, light shining through rotating cylinders imparts backward motion to tracks, ballast, steam and smoke in train scene above

scene. Electric bulbs within the cylinders cast lights and shadows on the picture as they revolve. In one scene depicting a train, the light action of the tracks actually goes backward to create the illusion of a locomotive speeding toward the onlooker. The painting can be taken off the frame and rolled up like a rug for shipment.

Rotating Stand for Kitchen Tools Holds Various Utensils

Various kitchen tools can be installed interchangeably in a handy stand that eliminates the need of holding the tools with both hands. The basic unit comprises a juice extractor, an egg beater and an enameled bowl that sets on a revolving base. A potato ricer and a food chopper also fit the standard pedestal.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



Standard base is used to hold food mixer (left) with bowl on rotating stand, and juicer (right)

Landers, Frary and Clark, New Britain

Lamp and Copyholder Unit Saves Typist's Eyes

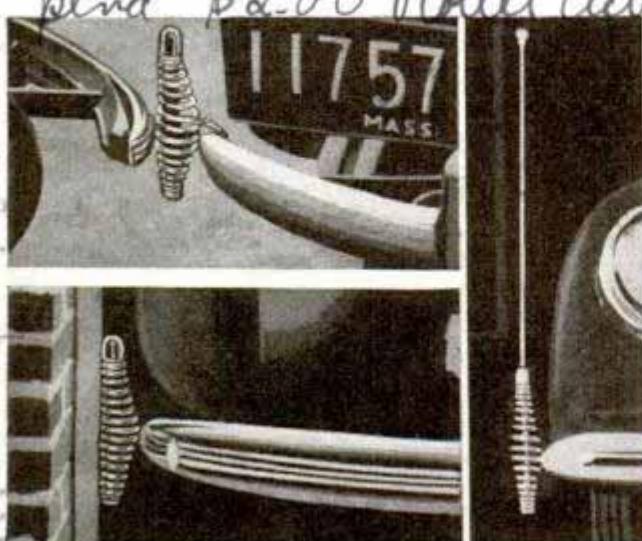


Typist is assured of good illumination from copyholder lamp. Line spacer is operated by hand

Light is shed right where it is needed by a lamp mounted directly on a typist's copyholder to lessen eyestrain. The holder itself is adjustable to any angle and it has a hand-operated line spacer. The light switch is located at the front, and there is a convenient holder at the base for pencils.

Fender Guard on Auto Bumper Serves as Feeler in Traffic

Mounted at the outer ends of front and rear bumpers, fender guards signal the driver as soon as they come in contact



Two views at left show how "feeler" guards fenders. Right, clearance guides can be added if desired

with another vehicle. Roller and spring action cause the guards to slide off of objects without damage, and the slightest jar is felt immediately in the steering wheel. The purpose is to prevent interlocking of bumpers in traffic and parking as well as to protect fenders and headlamps. The guards can be attached easily to the front and rear bumpers of any car.

9975

Circuit Breaker Like Big Gun Blows Out Arc with Air

Resembling the barrel of an anti-aircraft gun, an exhaust muffler is part of a pneumatic circuit breaker developed by General Electric which uses a blast of air, built up under pressure, to interrupt the circuit and break the arc. It is designed for 15,000-



Circuit breaker set up in unusual position. Base contains mechanism and long barrel serves as muffler

volt service at interrupting ratings up to 1,500,000 kilovolt-amperes, and is capable of protecting electric equipment in commercial installations which previously were limited to oil-type circuit breakers.

91114.

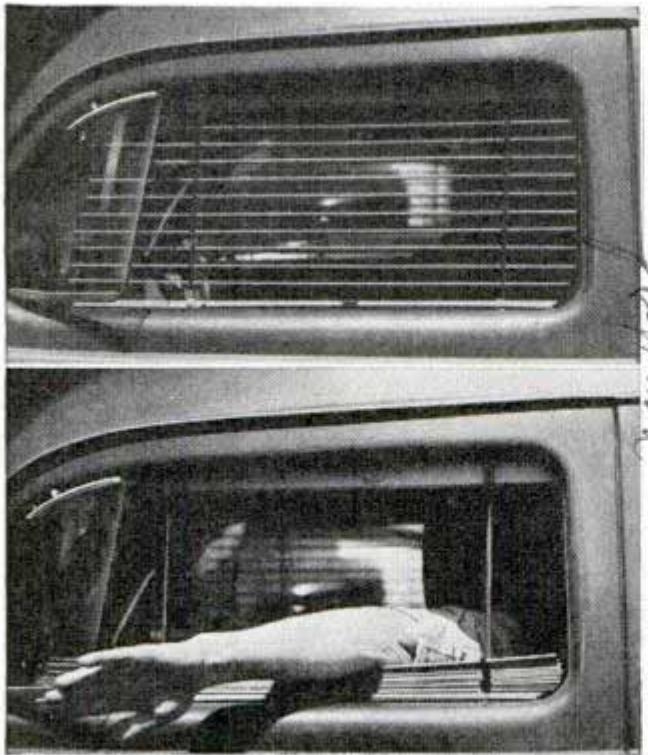
Weather Is a Military Secret to Countries at War

Information about the weather, of immense value in war, is guarded by warring nations as a military secret. In Britain, for instance, the publication or broadcasting of weather data—even of local thunderstorms—is strictly forbidden. Since

weather regularly moves from west to east, the geographical position of the western powers of Europe gives them the advantage of knowing what sort of weather is in store for Germany to the east. Advance knowledge of storms, cloudiness, fog and rain has been a deciding factor in the success or failure of air raids, major offensives, or naval engagements. This is particularly true in chemical warfare which is notoriously dependent on wind direction and the probability of rain.

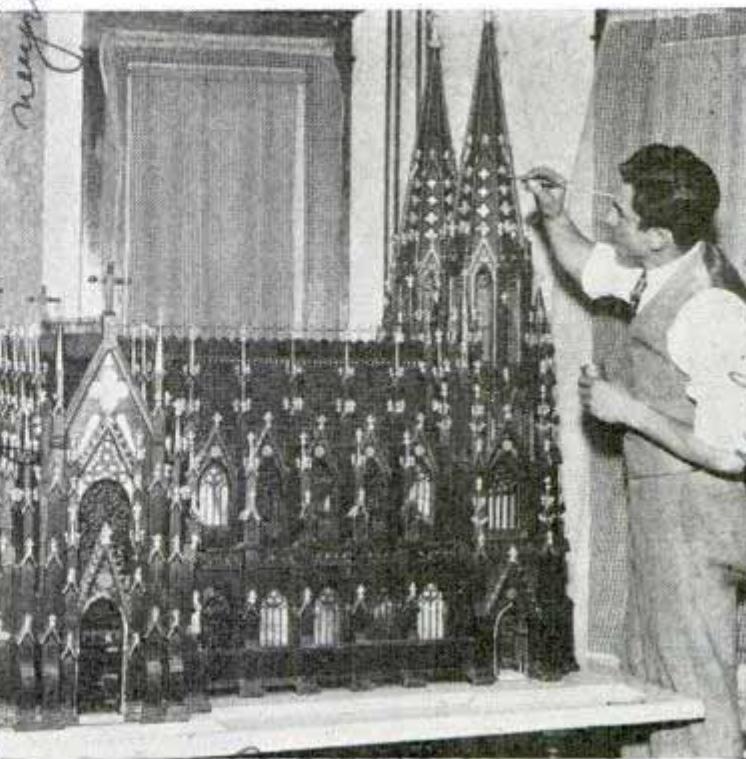
J 829 Venetian Blinds for Auto Reduce Glare and Heat

Venetian blinds for the automobile are now available, made to fit any type of square or curved windows. The flexible cord which controls the setting of the slats is operated by one hand, so that the driver can easily adjust the angle of the slats or drop the blind quickly for hand signaling. Besides reducing sun glare, the blinds keep the car interior cooler in summer. The blinds are made in sizes and shapes to fit any car.



New
Blinds raised to shut out sunlight and heat (top) can be lowered quickly with one hand for signaling

Lighted Model of Cathedral Has Stained-Glass Windows



Builder brightening up some high lights in model of cathedral fitted with stained-glass windows and interior lighting

Fitted with electric lights and stained-glass windows, a miniature of St. Patrick's Cathedral in New York City is the product of a three-year hobby. Into the five-and-one-half foot model went 16,352 pieces of boxwood all carefully fashioned.

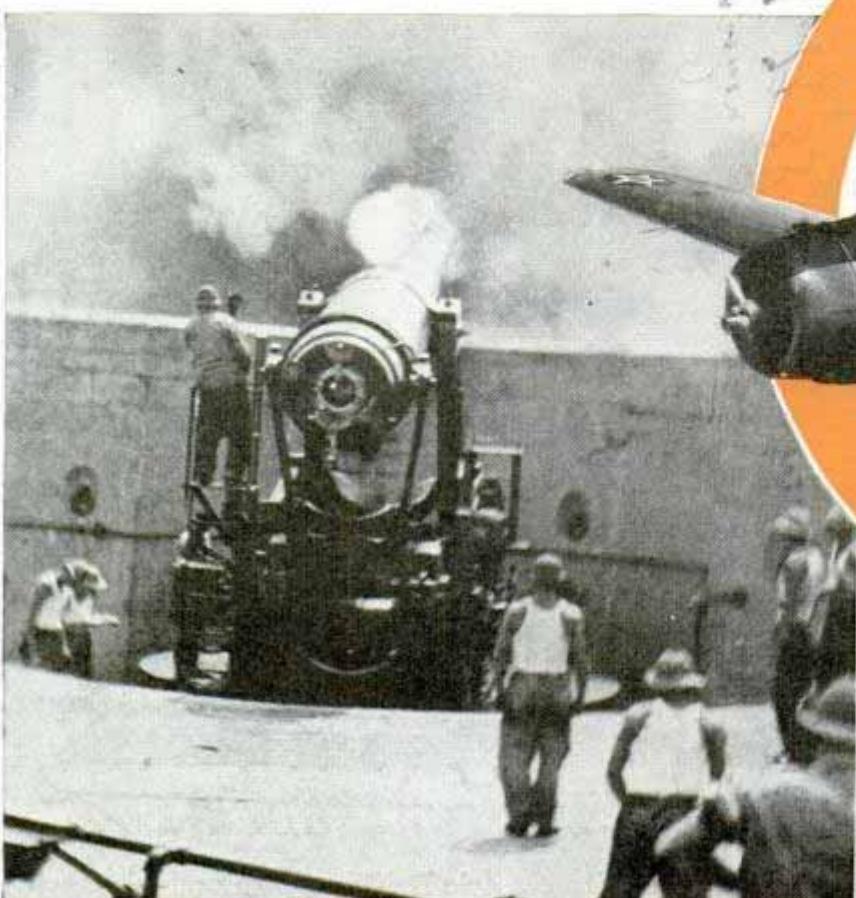
J 1141 Many Stars Are Nearer Earth Than Hitherto Believed

More than 5,000 stars nearest the earth, including many visible to the naked eye, are only half or a third as far away as previously believed, according to Prof. Jan Schilt, of Columbia University, who has found a small systematic error which changes the calculations made by the method of parallaxes. This involves sighting the angle of the star at intervals six months apart and then computing its distance by trigonometry. It is now suggested that tides and waves in the earth's atmosphere, caused by the moon's pull and sunlight above the earth, bend the beam of light from the star. Because of the systematic nature of the new correction, recalculation can be made without taking new observations of each star. The discovery does not affect more remote stars.

Oakland Mfg Co. 1631

8982 C.M.R. Survey J. W. E. 4322 Second Road Fort
Arlington, Va.

SHARPSHOOTING



Top, left, ten-inch disappearing gun at instant of firing. Bottom, battery of coast-defense mortars firing. Note projectiles in air. Upper right, observation plane used for artillery spotting which enables the gunners to fire accurately at targets they cannot see

SUPPOSE you were behind a hill with your gun, while a man on top of the hill told you over the phone where the game was, and you tried to hit it without ever seeing it at all.

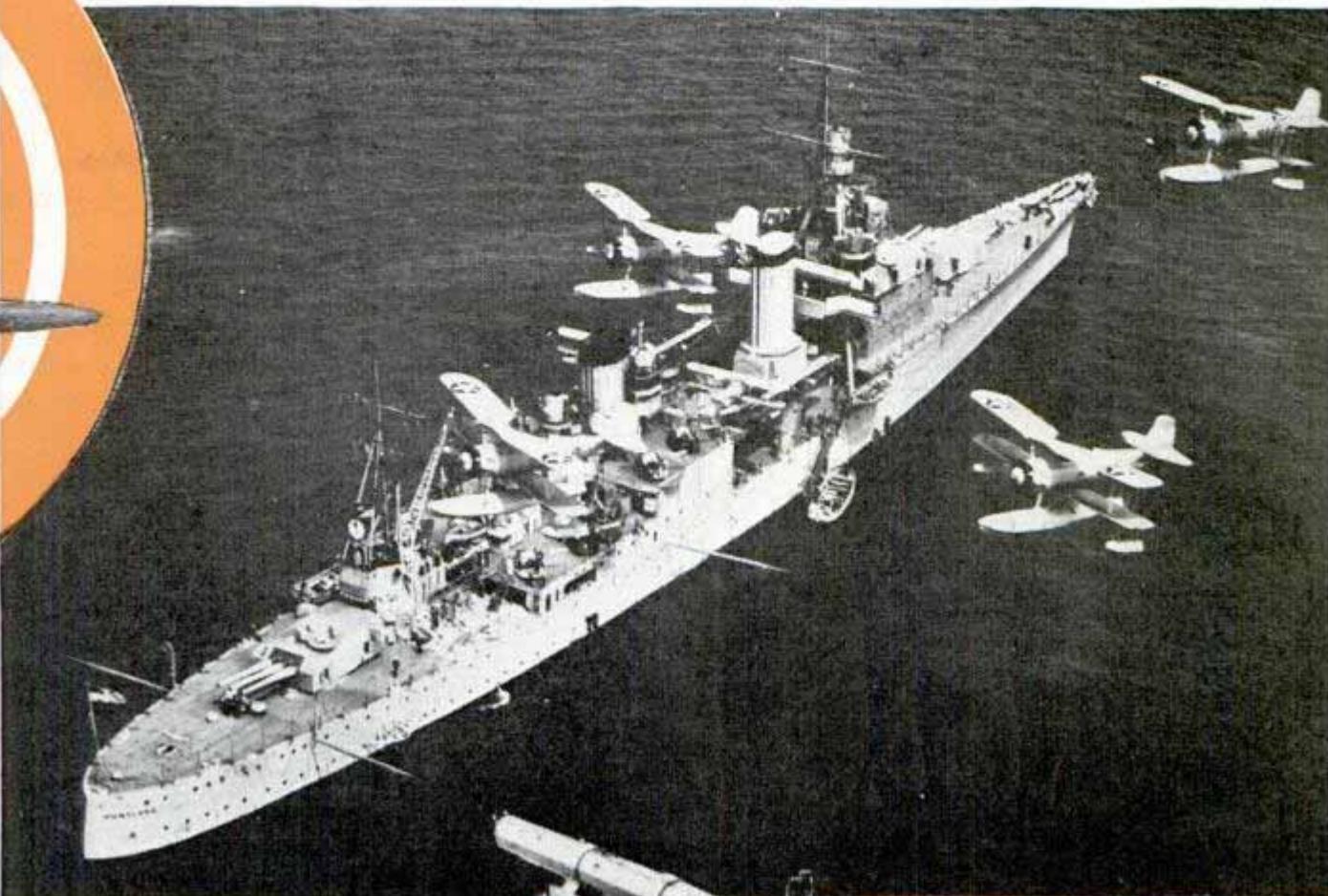
A ridiculous futility, you say, but that sort of shooting is everyday work to the artilleryman. It is seldom that the men who fire the guns ever see what they are shooting at.

Your coast-defense gunner has the easiest job of all, for the permanent installation of these guns permits a long and accurately plotted base line, and a wealth of specially calibrated instruments simplify the problem.

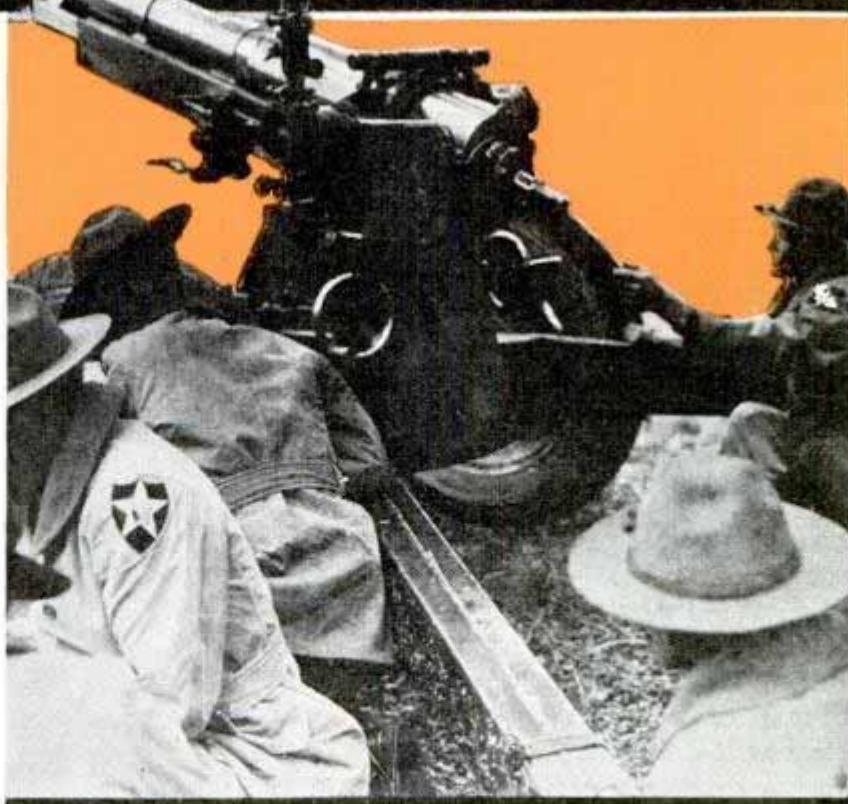
And the problem needs simplifying, for the effective range of a big seacoast gun is twenty-six miles. Its normal target will be a battleship moving thirty miles an hour. The gunners' view will be blocked completely by fortifications, even when mist, smoke screens or distance do not conceal the ship.

at UNSEEN TARGETS

5982



To score hits, the gunners must be furnished with the ship's direction, distance, course and speed. And the gunner cannot aim where the ship is at the moment, for it takes more than three minutes for the huge projectile to reach its destination at extreme range, during which time the ship will travel a mile and a half. At these long ranges there are many things to be considered that the hunter need never worry about—the so-called "variables," that cause the shell to deviate from its normal trajectory. In a vacuum that trajectory would be a symmetrical curve, but air resistance slows down the shell so that it falls at a much greater angle than it arises. The altitude attained



Top, observation planes flying above the U.S.S. cruiser "Portland." Bottom, new 4.5 field piece, with split trail, ready for firing. Note that the gun is mounted on a carriage which facilitates rapid movement as the attacking force advances on the enemy



by a sixteen-inch shell at maximum range is more than twelve miles, so not only must the density of the air at sea level be computed, but the varying densities of all the higher layers of air that the shell must pass through. Barometer and humidity readings are always possible at sea level, and the higher readings may be obtained by airplane or balloon in peacetime. But during war it seldom will be possible to obtain such readings when needed, so tables of averages, based on sea-level readings, must be used. This factor is far from trifling, for air density can cause a fifteen-per-cent possible error—one and three-fourths miles at maximum range.

The velocity and direction of wind, from sea level to stratosphere, must also be known or estimated, for a twenty-mile wind will carry a shell a full mile off its course during the three minutes it is in the air. The wind might vary from ten miles an hour at sea level to eighty miles an hour at the top of the trajectory; so these varying forces must be computed ac-

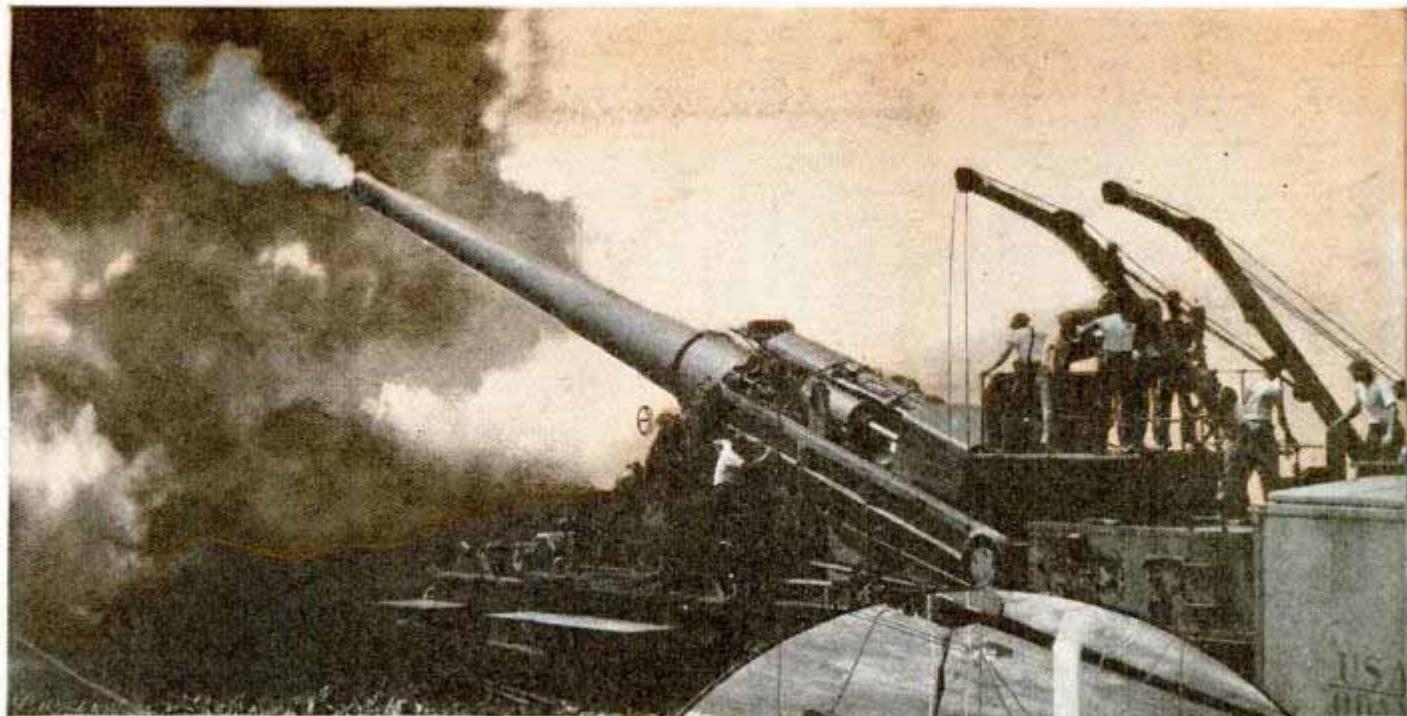
cording to the length of time they affect the shell.

And at those long ranges, the earth can no longer be considered a stationary flat object. Both its curvature and rotation must be allowed for. A gun firing north, for instance, must be aimed 175 yards east of the target at maximum

range, else the earth will have rolled the target out from under the descending shell. Rising or falling tide will also affect range, by changing the elevation of the target in relation to the gun.

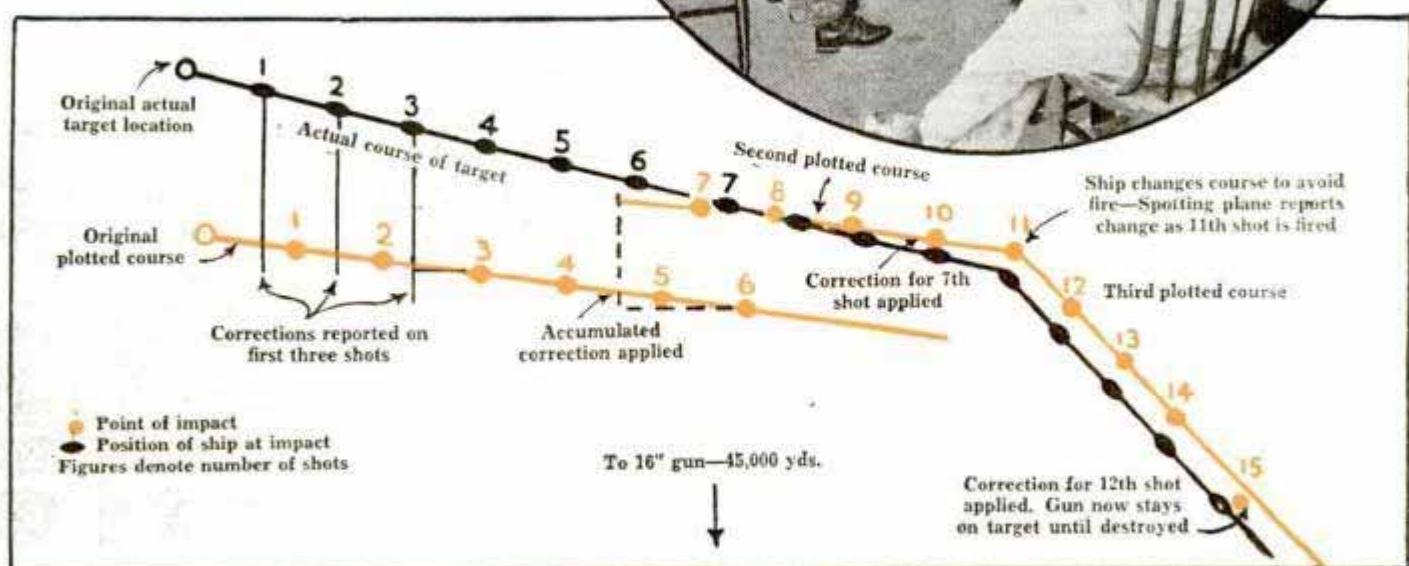


Top, six-inch disappearing gun immediately after firing. Note that recoil mechanism is returning gun to loading position. Circle, optical range finder, being used here for anti-aircraft fire, also is used for practically all naval gunnery. Bottom, sixteen-inch coast-defense gun in action



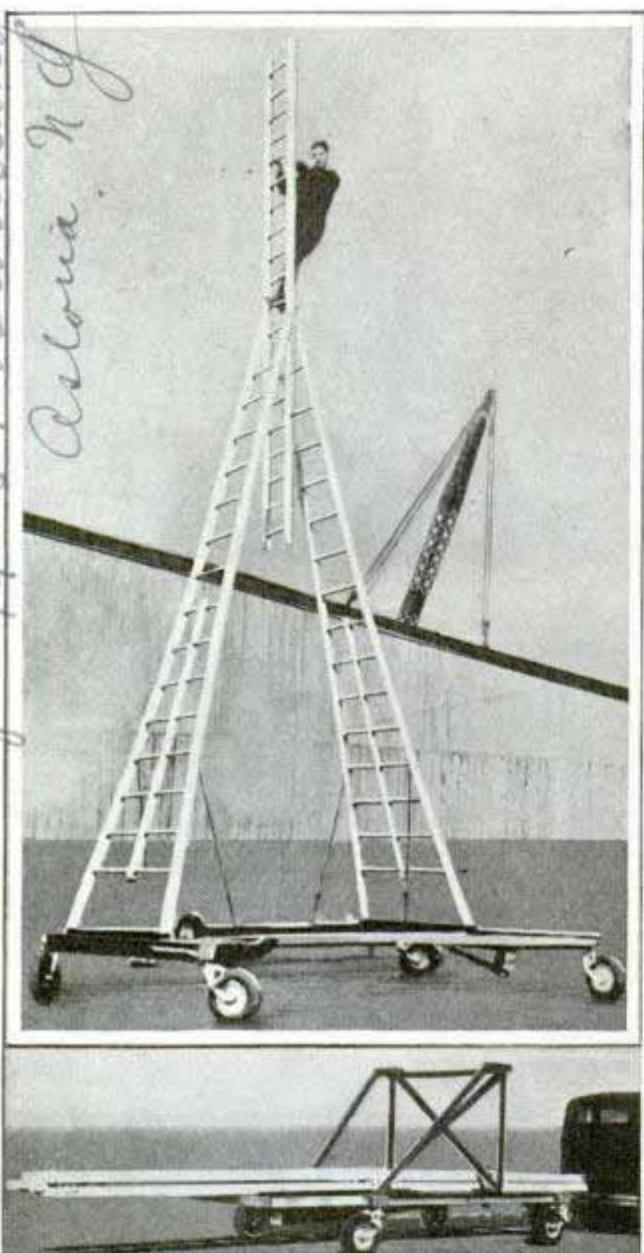
Powder temperature is another variable. Warm powder burns faster than cold, a change of ten degrees causing a difference of 300 yards in the distance the same amount of powder will hurl a shell. These huge projectiles, weighing more than a ton, will vary a few pounds too, thus varying the distance which a standard charge of powder will hurl them.

(Continued to page 144A)



Top, firing a sixteen-inch railway gun. The crew depends almost entirely upon aerial target location and spotting. Circle, plotting room of coast artillery battery with plotting board in use. Bottom, how spotting places gun on target, causing destructive hits after several shots have been fired

Portable Scaffold on Wheels Towed to Job as Trailer



Scaffold ladders are quickly erected, or folded as shown below for towing to the next job

Scaffolding equipment that serves as its own trailer when towed from job to job is built on a four-wheel chassis for quick and easy portability. Capable of reaching heights up to fifty feet, its group of extension ladders may be fitted together in various positions such as leaning, straight up, towers to support a railed platform on top, and scaffolds upon which planks may be laid, the parts being tied in place with sectional braces, telescopic pipes and long eye hooks. Ladders are aluminum or wood for ease in handling, and other parts are steel. The two long axles with their

wheels, mounted on the sides of the oblong chassis, can be removed and placed across the narrow ends to make a broad, non-tip base for the tall structure. All four swivel wheels may be locked in the best position to provide stability, and a fifth wheel also can be lowered for additional steadiness.

Lock Washer Pre-Joined to Bolt Is Mechanics' Timesaver

Mechanics can save the time wasted in putting lock washers on screws by using a pre-assembled unit that is ready for application. The proper type and size washer is held securely on each screw so it cannot come off. They are especially handy for insertion in places hard to reach.



Loud Speakers on Motorcycles Help Police Direct Traffic

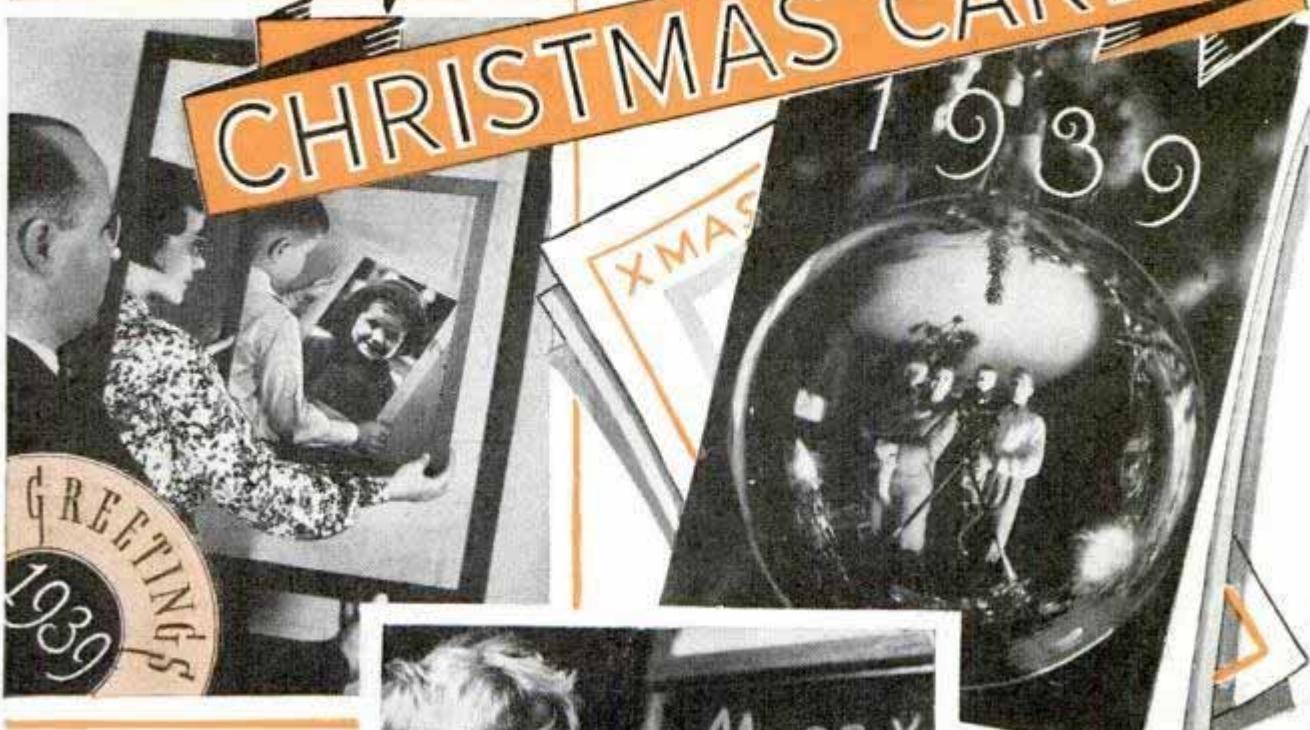
Loud speakers now being installed on motorcycles of the London police force, while intended primarily for the normal duties of directing traffic and pedestrians, are used also to give alarm in case of air-raid warnings and to help people locate shelters. The microphone is attached to the handlebars, and the loud speaker is fitted in front of the vehicle.



Loud speaker mounted in headlight's place is used by London motorcycle cop to direct traffic

Eastman Kodak Co.
Rochester, N.Y.

SNAP Your Own CHRISTMAS CARDS



For a really original Christmas card, put your camera to work. It can make anything from the family-portrait and house-in-the-snow scenes to the distinctive cards shown here. Composite, above, was made by photographing each person holding a card and pasting one on top of another



Family's reflection in Christmas-tree decoration, top, was snapped with camera with double-extension bellows, focusing on ground glass. Left, blackboard greeting in playroom. Below, an "over-the-typeewriter" shot



Table-top pictures offer a variety of ideas for clever holiday greetings. A model billboard was used for the card above, with enlargements and Christmas message pasted on it



108-2-66
newsp

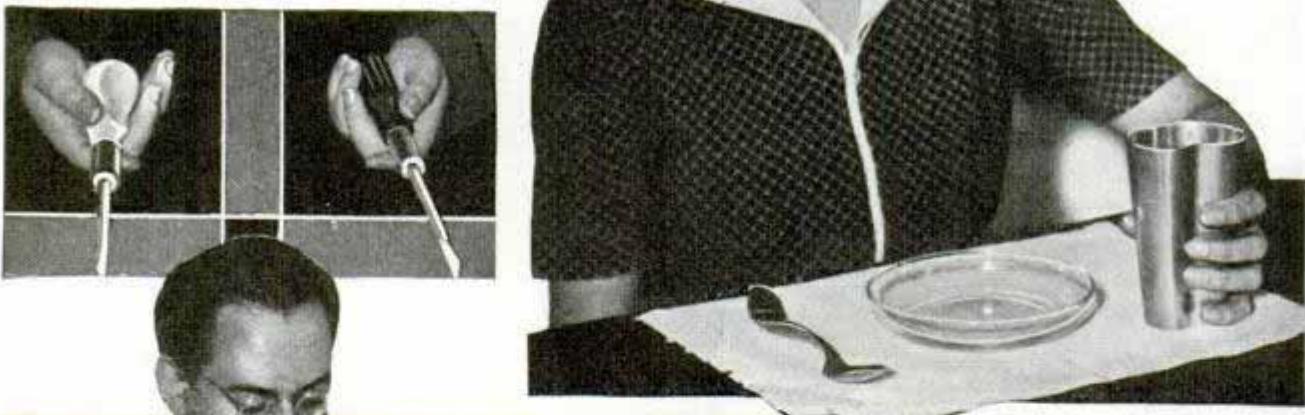
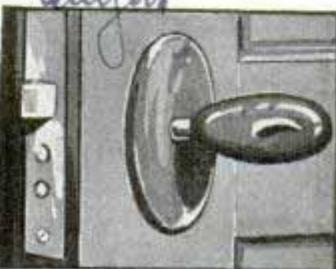
Everyday Articles Redesigned for Comfort



newsp
Designer Bisenz with pen which he says will improve penmanship and eliminate writer's cramp. He calls this kind of designing "formagenics" and hopes to increase the utility of ordinary articles



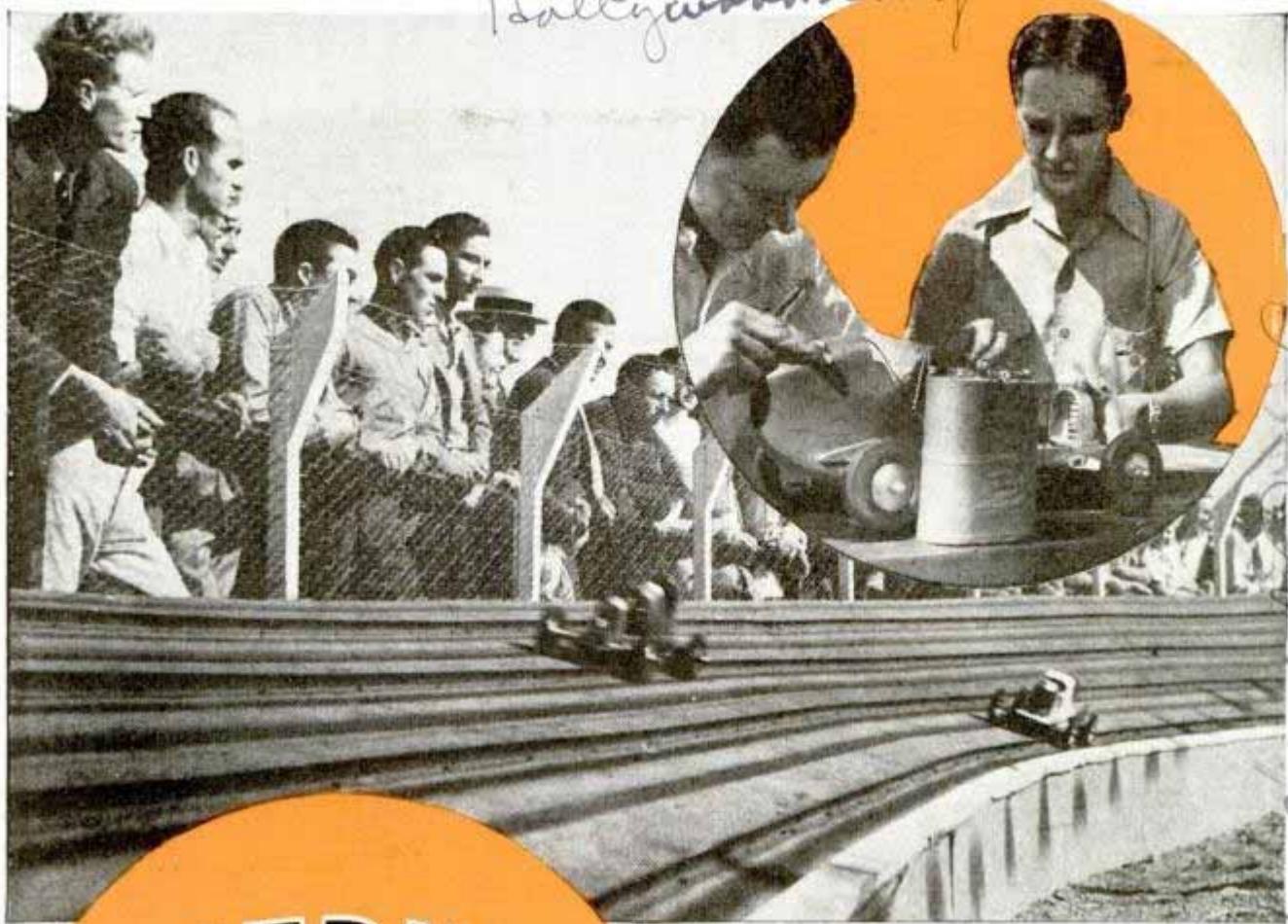
newsp
Designing ordinary articles to fit the needs of the human body is being accomplished by Angelo Bisenz of New York. Above, safety razor shaped for easier handling



newsp
Center, formagenic glass, plate and spoon. Just above, new design in doorknobs. Center, left, formagenic screwdriver compared to old style. Bottom, Bisenz working on formagenic hairbrush. Note sketch of brush and unusual handle. The formagenic screwdriver has grips fitting the fingers instead of ordinary straight grooves on the handle. Fitting articles with nonslip handles will prevent many accidents, the designer contends. He plans to extend his work into the furniture, housing, automotive and many other fields

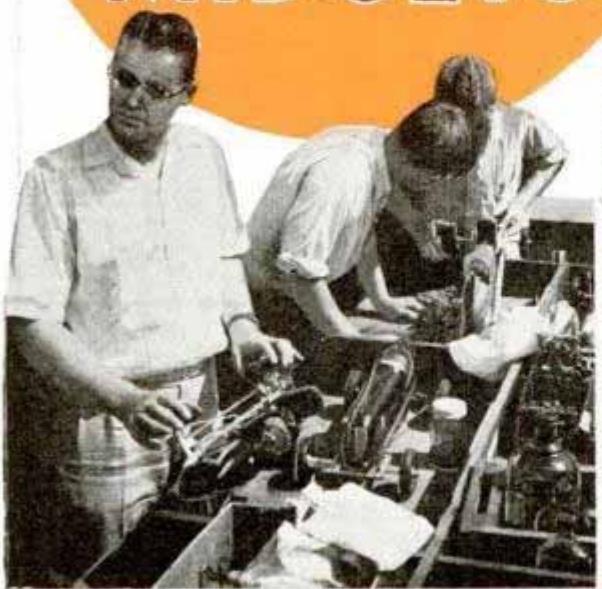
Mr. Charlie Mehr,
6362 Hollywood Blvd.
Hollywood, Calif.

2/10/39
The Model Midget
Raceway, Los Angeles,
Calif.



SPEEDWAY for BABY MIDGETS

Designed for model racing cars, a new speedway in California is one-sixteenth of a mile long. There are four rails around the track and each car has a device with two small bearings that run against the rail. Thus, the car is guided as it travels at speeds around sixty miles an hour as centrifugal force keeps it on the speedway. Four cars may run in each event, each running against time. A wire rod protruding from the left side of each car is the ignition switch. Lowering a wire across the track trips the switch on any car which the race officials desire to stop.

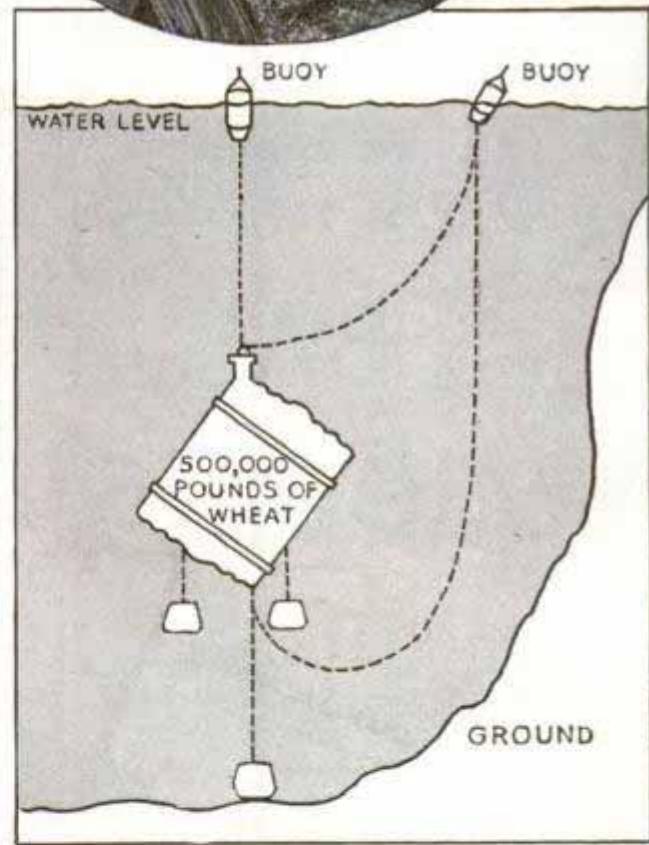
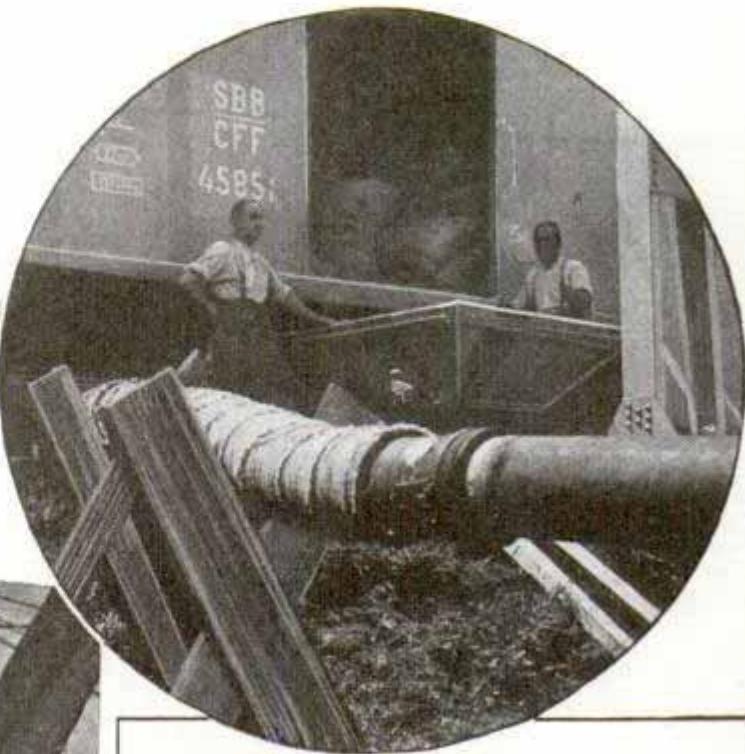


Top, spectators at the speedway. Circle, owners adjusting cars. Bottom, left, owners in the pits. Right, wire across track trips ignition switch of any car. Each racer weighs ten pounds, costs about \$60.

Wheat Stored under Lake for Wartime Needs

Block & Lar Obstruction Co. is reusing its
old logging site

Right, wheat dumped into compressor pipes is forced into tank shown below. Sketch, at bottom, right, illustrates the tank submerged in lake.



As a precaution against the possibility that a war blockade may interfere with imports of food, Switzerland is storing wheat at the bottom of her deep mountain lakes. The grain, forced into a tank of 500,000 pounds capacity, is expected to remain unspoiled under water for years.

"One-Lick" Forest Fire Fighters Clear a Lane Quickly

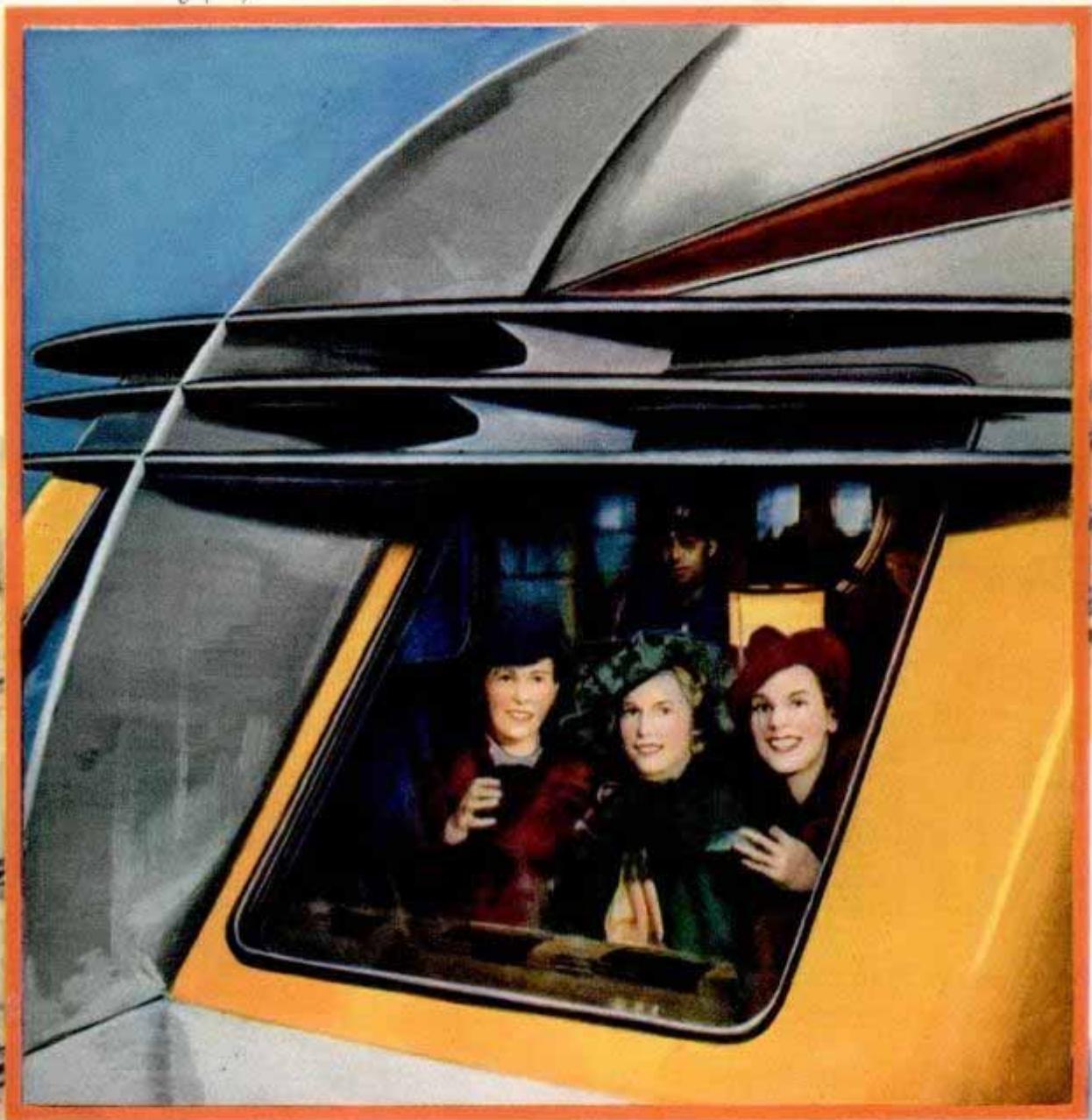
Cutting fire lanes in a forest by the "one-lick" method now being adopted is accomplished about three times as fast as by any other manual system. Formerly each man, equipped with ax, rake and shovel, covered one sector of the line. Now the fire fighters are divided into crews of axmen,

rakers and shoveling. As the axmen advance each takes just one stroke at any tree or brush; if that does not clear it the man behind takes the second. After the axmen come the hoe and rake squad, and they are followed by the shovel crew, each taking his turn at the line.

Dept. of Agriculture. Release No. 1110
Oct. 8, 1939

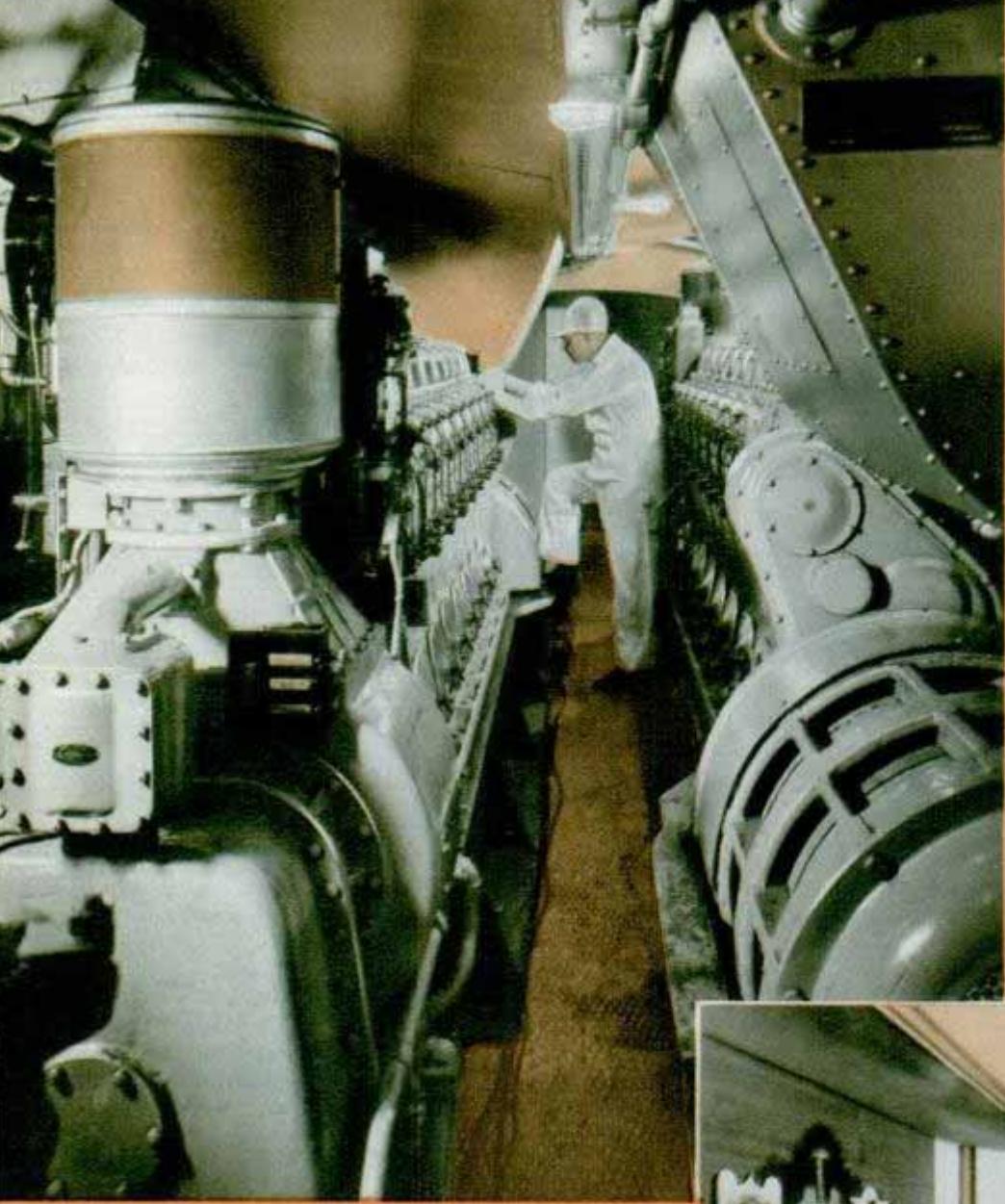
CLEAR TRACK AHEAD

819



Comfort and speed are being combined in the modern train. Top,
unusual rear end of one of the streamline coaches. Below,
the New York Central's majestic "Twentieth Century Limited"





8

Diesel power, believed by some railroad operators to offer economical means of driving the super-trains, is illustrated at left. Here is the engine room of the "City of Los Angeles"

De luxe service is fast becoming common on American lines. Below, the interior of dining car used on the Pennsylvania Railroad, looking toward buffet and pantry end of car

*Built by Budd
mfg Co. Phila
Designed by Raymond Loewy*

818

By F. E. Williamson
President, New York Central Railroad

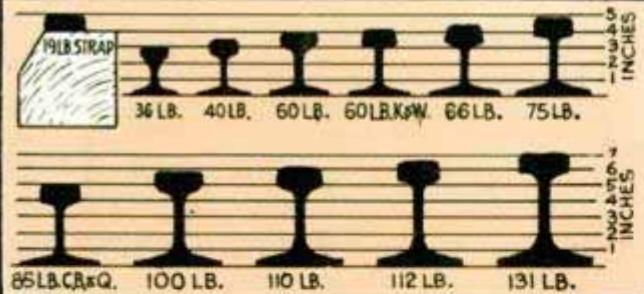
MAN'S age-old struggle to conquer time and distance has reached its present astonishing approach to fulfillment through the discoveries and the resulting marvels achieved by modern science. This is particularly true in the case of the railroads.

To cite one example, the streamline lightweight trains which have captured the imagination of America and in a way have started what it is hoped will be a renaissance of rail passenger travel have been made possible largely by recent developments in metallurgy. Protracted and laborious research in the mills and laboratories has resulted in the creation of numerous new alloy steels and other metals which have lent themselves to novel uses. Even ten years



ago many of these were either unknown or their production commercially was impracticable for varying reasons, one of these being, in some instances, the factor of cost. To show how fully the use of these new alloys has entered into the production of the modern train, I might say that lightweight high-tensile steel and at least six alloys were used importantly in the new Twentieth Century Limited.

Rails—1850 to 1938



Burlington
Advancement in rails is illustrated in chart (above). Right, control cab of a streamliner's power car. Note telephone (at left) on which driver may communicate with other trainmen. Below, double-decker coach which is operated by the Pennsylvania Railroad in New York suburban territory has exceptional passenger capacity
Long Island

Such advances as these have been, in great part, the result of constant research and experiment, both in the field of theory, of day-by-day practice and in technical scientific laboratories. Too little has been realized by the public of the ceaseless efforts in this direction made both by the railroads themselves, as well as by the great equipment companies which serve them. Yet for many years, both branches of the industry have been engaged in intensive experimentation, often jointly, in an effort to create better equipment and facilities and to do this,



if possible, at a lesser expense. So great has been the volume of equipment and so high the safety and service standards involved and so vast the expense that even when better materials or methods have been found and tested, changes from the old to the new often have had to be necessarily slow. Rapid wholesale replacement has not been economically feasible. After all, a steam locomotive is built for a useful life of at least twenty years and costs \$60,000 to \$145,000 or more. Hence, important though these changes may be, often they have lacked spectacular ap-



820

J 1950

Progress of American railroads is demonstrated in these photographs of the latest locomotives. Left, giant steam-electric power car which the Union Pacific had built for service on long runs.



Steam power is not lagging in the railroad parade. Left, we see the Pennsylvania's "Broadway Limited," which has streamline coaches fitted with close-fitting vestibules and curving "skirts."



Awe-inspiring are such trains as this, the Baltimore and Ohio's "Royal Blue," pictured here with a streamline "Bullet" steam locomotive substituting for Diesel-electric power car.





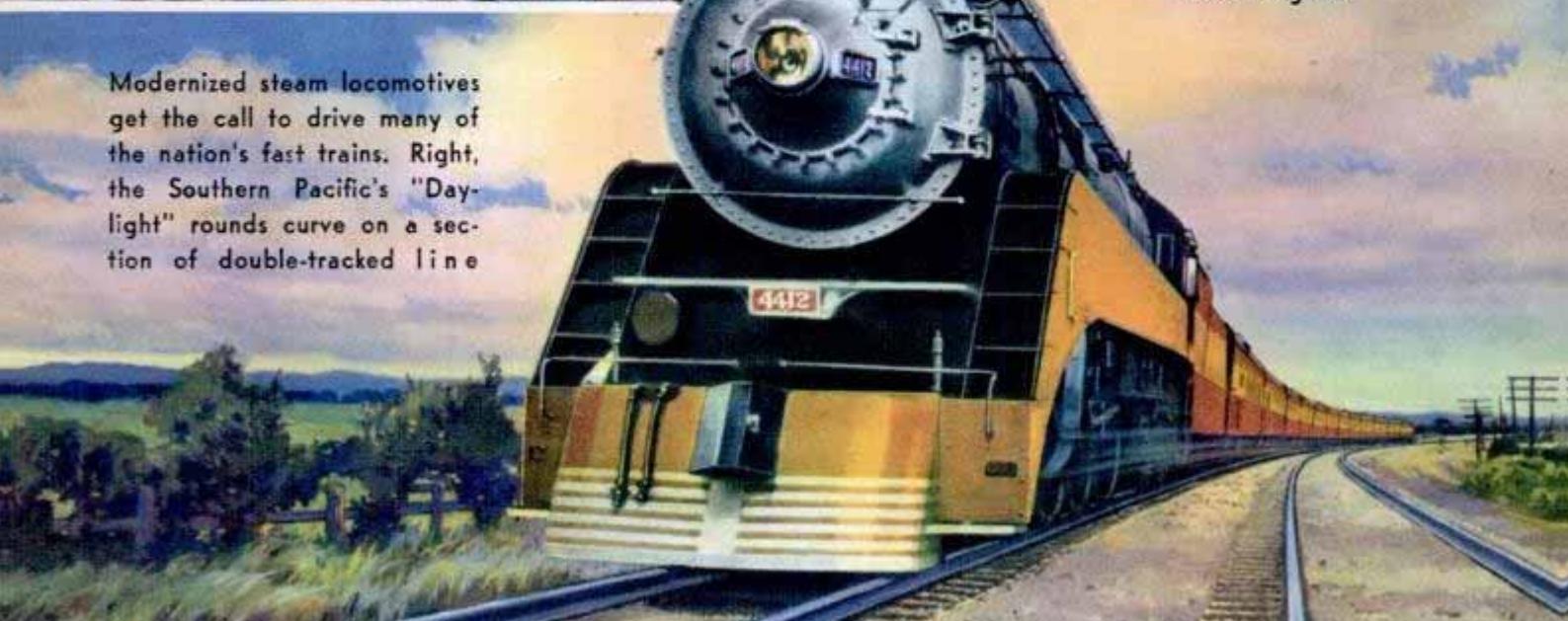
9748 821

Colorful to a degree never dreamed of in the early days of railroading is the Seaboard Railway's "Orange Blossom Special" (above). The Illinois Central's "Green Diamond" (right) averages a mile a minute



Modernized steam locomotives get the call to drive many of the nation's fast trains. Right, the Southern Pacific's "Daylight" rounds curve on a section of double-tracked line

Zephyr trains, of which the "General Pershing" (pictured at left) is the latest, provide fast service on the Burlington. These streamliners, built of stainless steel, are propelled by Diesel engines



87
peal and thus have met with meager public appreciation.

For many years the railroad industry has participated in both creative and applied research to improve its service and at the same time reduce its expenses. As examples of recent creative research I might mention the development of new means for detecting fissures in steel rails, as well as the development of methods looking toward the greater prevention of fissures; a ten-year program on air brakes which resulted in the development of a new and much more effective freight triple valve; the development of efficient systems for air conditioning passenger cars—11,027 cars already have been equipped with air-conditioning systems and this work is being expanded as finances permit; and the locomotive booster, a valuable auxiliary to increase a locomotive's power temporarily for starting or on grades.

The test departments of the railroads are chiefly concerned with applied research. Applied research results in greater efficiency, economy and safety in daily operations. It is, in essence, a constant search for better equipment, materials, supplies and processes, particular emphasis being laid on those factors that make for safety.

Among other subjects selected by the railroads for intensive research are the effect of fatigue on rolling stock axles; boiler feedwater studies, which include the testing of compounds designed to prevent caustic embrittlement; the development of disk-type driving wheels for locomotives; development of a device to indicate proper selection



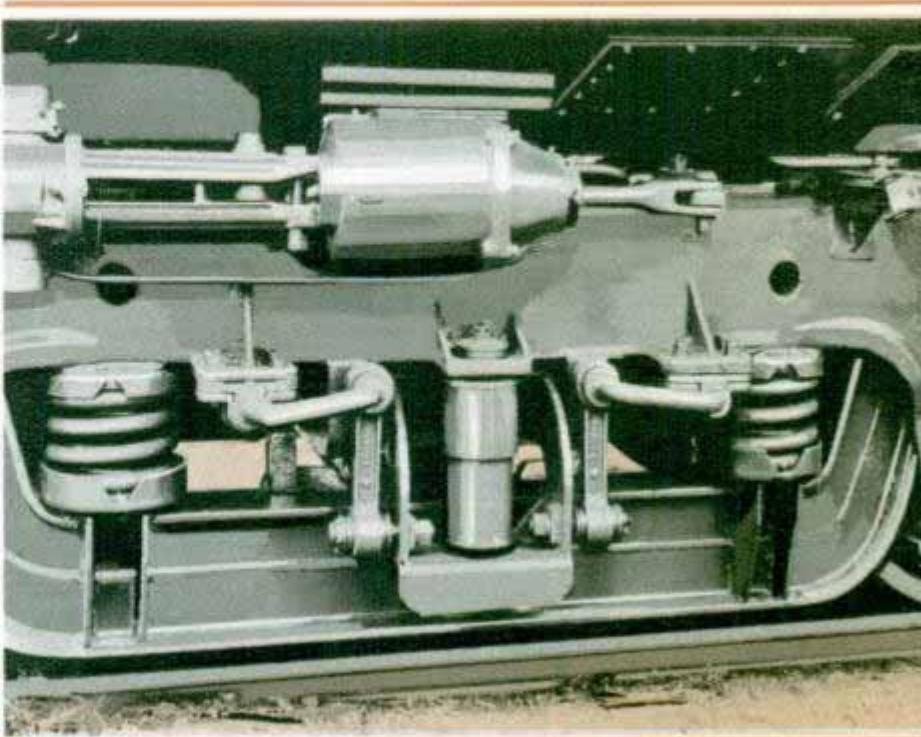
Strength, without an increase in weight, is achieved by fastening "fluting" (top photo) to the gleaming surface of Budd-built stainless steel cars. Below, attractive interior of tavern coach on Seaboard's "Silver Meteor." Some of America's foremost designers participated in styling today's trains

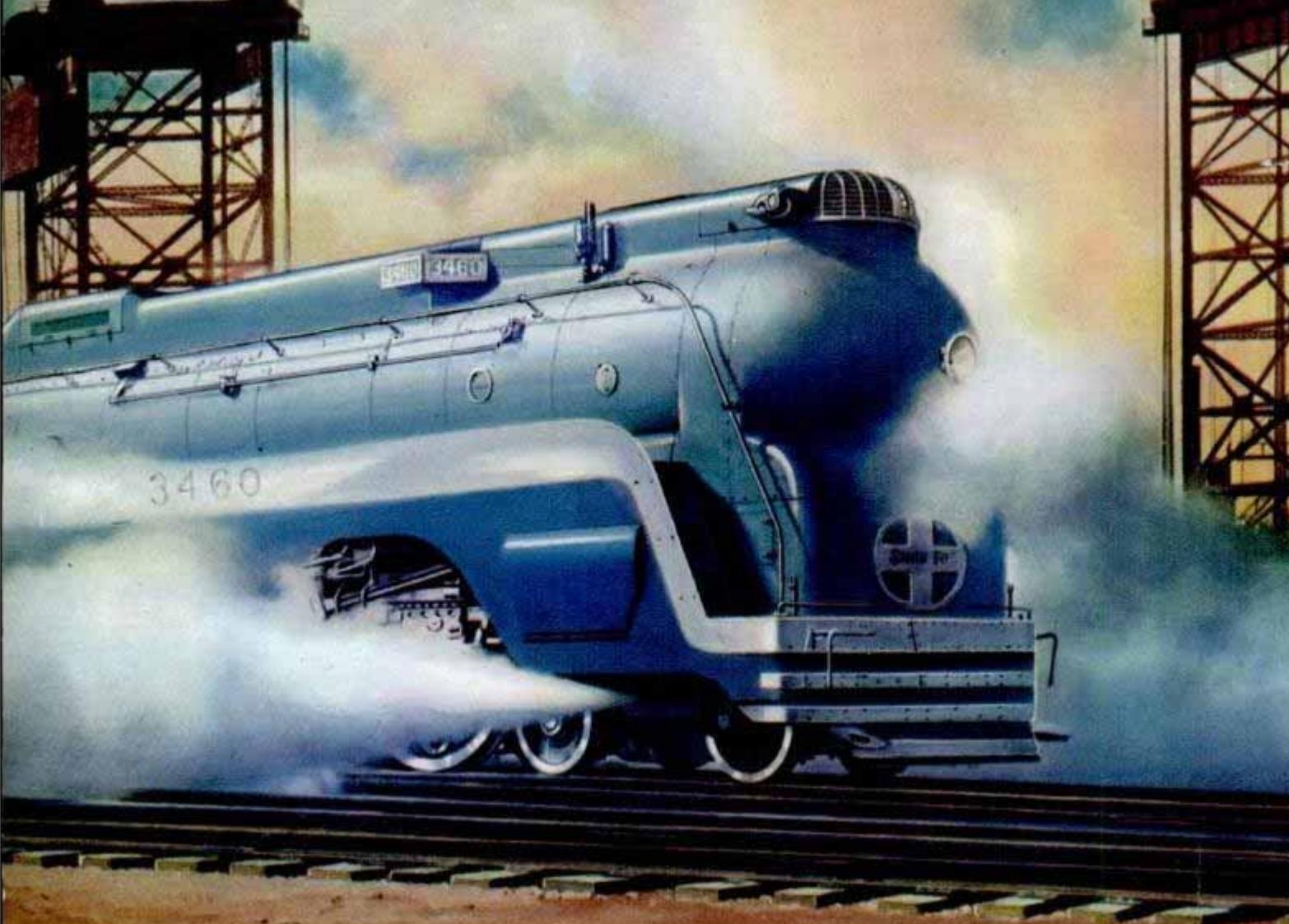


823
and use of the cut-off necessary to produce the maximum drawbar pull and horsepower available in the locomotive at all incidental speeds and to avoid waste of fuel and power by the use of longer cut-offs; the development of roller bearings on both wheels and driving journals; the development of new automobile loading devices; the development of container cars and containers; drop-type couplers in combination with the steel pilot; experiments with longer rails and substitutes for the wood tie.

Literally hundreds of other subjects have been investigated. Much of this research has produced concrete results, making possible improved and safer service. As an example, in 1938, the railroads established a new record in fuel efficiency in freight service. In that year, to haul 1,000 tons of freight and equipment one mile required only 115 pounds of fuel, against 172

8248
Luxury on rails is the objective which most operators have reached, and the photo above illustrates the point. Like a finely furnished home is this observation lounge which is a feature of the "Silver Meteor." Below, trucks of the Milwaukee Road's streamliner "Hiawatha" embody such innovations as coil springs, hydraulic shock absorbers, rubber mountings and roller bearings that free the cars from jars, jolts and sidesway





824

Speed is visible in every line of this steam locomotive, used by the Santa Fe to pull its high-speed train, the "Chief," between Chicago and the west.

g 748

pounds in 1920, a reduction of thirty-three per cent. In passenger service, fuel efficiency in 1938 improved twenty-one per cent, against 1920, a passenger train car being hauled one mile with fourteen and nine-tenths pounds of fuel.

Another result of research has been the increase, with safety, of regularly scheduled operating speeds both in freight and passenger service. In 1932, there were only a handful of trains operated at an average speed of more than sixty miles an hour. In 1938, 48,164 miles were being covered at speeds of sixty to eighty miles an hour and even higher. In six years this mileage increased about twenty-four times. Today, the United States has more high-speed trains than any other country.

Railroads differ from most other industries in that they do not make things to sell to consumers—they purchase things and utilize them in combination to produce service. Every year they buy

more than 70,000 items of equipment, materials and supplies. It is only natural, therefore, that the makers of these items should engage in research to improve and perfect their products and that the railroads should often be a partner in this work, but always a beneficiary of it.

Ceaselessly railroad research goes on day after day. At Purdue University there is a railroad laboratory, maintained for years by the Association of American Railroads, where draft gear, couplings and brake shoes are under test continuously, and at the University of Illinois, in a laboratory operated jointly by the Association of American Railroads and the steel companies, steel rails undergo tests. In Maryland, Indiana and Illinois special track installations have been under study to determine their performance under traffic.

The problem of reducing in both
(Continued to page 128A)

1836 Market St., Phila Tuning a Violin by Sight with 'Dancing' Wire

With a simple tuning device invented by a Philadelphian, any amateur can tune a violin by using his eyes instead of his ears to check the pitch. The tuner consists of a rigid steel frame rather like a hacksaw holder, with a piano wire stretched across it. A screw at one end permits



Suggest Electric pencil sharpener made by F. A. Smith Mfg. Co., Rochester, N.Y.

screw is adjusted until the piano wire vibrates and a "washer" on the wire dances violently, indicating the wire is in pitch with the tuning fork. The tuner is mounted on a wooden sound box. To set a violin in exact pitch, it is held against the sound box and the tuning nut of the proper string



Left, sound box with tuning wire stretched on steel frame; right, tuning violin by holding it against sound box and watching vibration of wire

manipulated until the wire of the tuning device vibrates. It can be used similarly to tune any string or wind instrument.

2/10/58 Fertilizer Is Forced into the Earth with Compressed Air

Introduction of fertilizer into the soil is facilitated by a system employing ground

drills and compressed air. After the earth has been drilled, the fertilizer is forced beneath the surface with the aid of air-pressure machines, thus enabling workers to nourish roots deep in the ground.



One worker drills hole while the other forces fertilizer deep into the soil

2/10/58 Self-Starting Pencil Sharpener

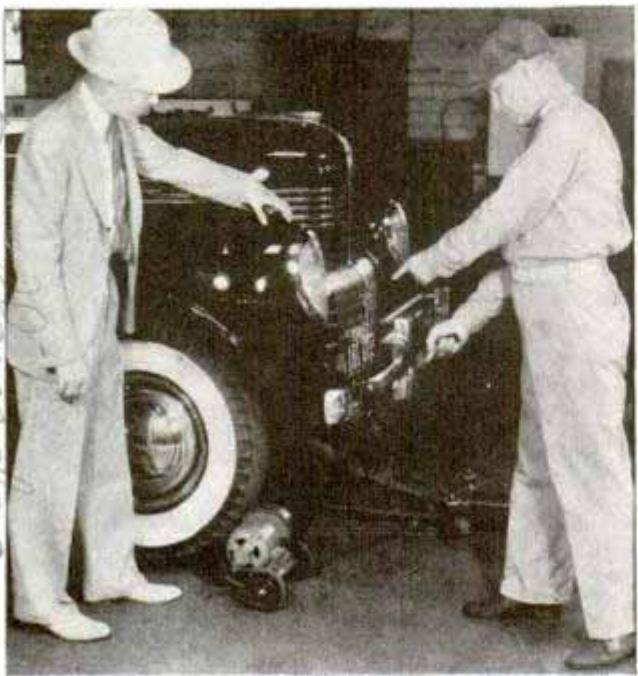
Pencils are sharpened automatically by an inexpensive electric grinder that starts itself and stops as soon as its work is done. Inserting a dull pencil through the opening at the top sets the tiny motor going. Then as the lead is ground to a fine point, the current shuts off automatically.



Used at Westlake Park, not on market yet

*Acme
Philadelphia, 11365
North Hollinwood, Calif / Venetia Blvd.*

Wheel Is Spun at 100 Miles to Check Its Balance

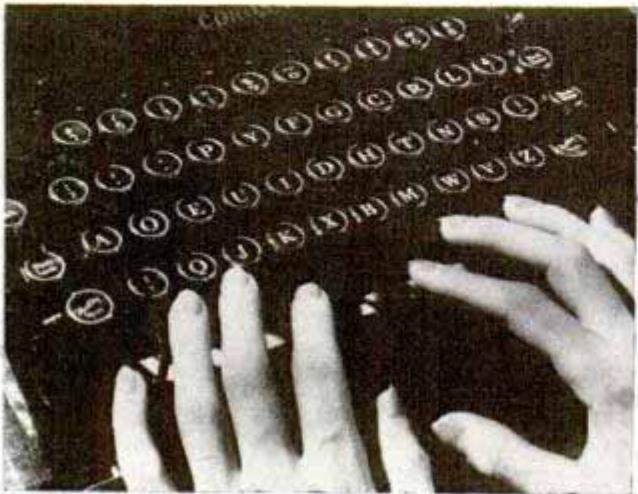


Checking balance of auto wheel by rotating it at high speed. An electric motor supplies the power.

Automobile wheels are checked for shimmy or unbalanced condition in three to five minutes by spinning them at high speed. Operated by an electric motor, a rotating wheel is set in contact with the raised tire, quickly accelerating it to the equivalent of eighty or 100 miles an hour. If the wheel is not correctly balanced, the body and frame will vibrate under the test.

Simplified Typewriter Keyboard Increases Speed of Typist

Increased speed in typing is claimed for a radically new arrangement of the type-



Keyboard arrangement that speeds typing

writer keyboard that distributes the work more evenly between right and left hands. For instance, with the standard keyboard more than 2,700 words must be typed with the left hand alone, while on the new keyboard there are but sixty-nine common words, most of them monosyllables, typed with the left hand. Since touch typists return and rest their fingers on the "home" or second row from the bottom, it is arranged so seventy per cent of all key stroking is done on this row, which helps to lessen fatigue. Operators trained on the standard keyboard can learn the simplified arrangement in a short time. Manufacturers of standard typewriters will furnish the new keyboard if requested.

Rubber Mats Are Made at Home with Set of Simple Tools

It requires only a few simple tools to assemble rubber door mats in various designs at home. A complete outfit includes a designing and construction board, wire

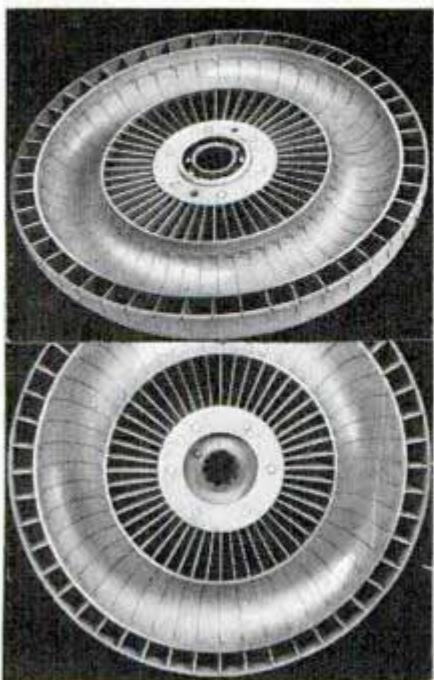


Mats of various designs can be made at home with complete set of simple tools supplied in kit form

benders and cutters, and a tool for closing sleeves over the wire ends. Standard size mat links are supplied in black, white, red, orange and blue, and wires come in suitable lengths. To construct a mat, the rubber links are placed on the board in the desired design, wires threaded through the links, protruding wire ends pinched down, and metal sleeves closed over them.

J. W. Oliver, 1126½ E. 92nd St., New York City

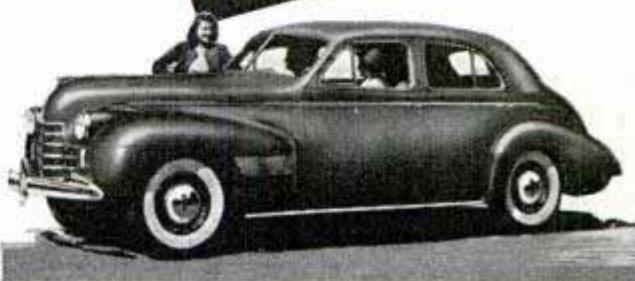
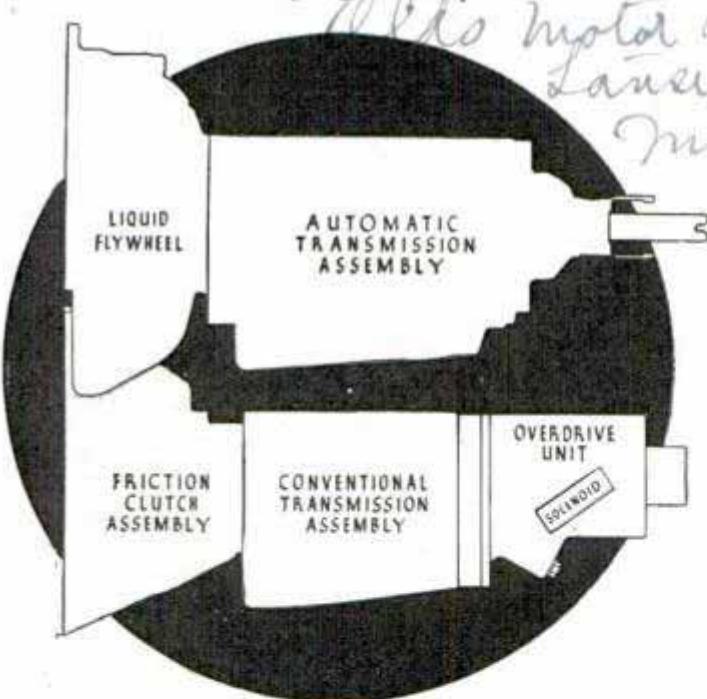
Automatic Drive Car Has No Clutch Pedal



Hydra-Matic Drive

Automobile control is simplified by the "Hydra-Matic Drive" offered at extra cost on the 1940 Olds. It consists of a liquid flywheel and an automatic transmission, the combination of which eliminates clutch and clutch pedal. To get the car under way, you start the engine, move the lever under the wheel from "neutral" to "high" and step on the accelerator.

The car changes gears as speed increases



Hydra-Matic Drive

Top, left, parts of liquid flywheel. Right, car has no clutch pedal. Center, left, drawing comparing "Hydra-Matic" with conventional drive to which overdrive has been added. Right, two photo-diagrams illustrating drive ease of "Hydra-Matic" system (top) compared with multiple operations required by conventional drive. Bottom of page, photo of the new Olds. Use of a fluid flywheel reduces wear, eliminates crankshaft vibration from passing to the transmission and cushions application of power to the rear wheels, thus relieving rear axle gears of considerable strain. Oil is the medium employed between engine and transmission

10
85
...Conf. Thomas E. Linnon, Jr., 10555 Melrose Ave - Los Angeles



The GOLDEN AGE of



By Vern O. Knudsen, Ph.D.

Professor of Physics,
University of California, Los Angeles

WHEN nature developed our ears as instruments to warn us of danger she didn't foresee our present noisy civilization and failed to provide us with "ear-lids" with which we could shut out objectionable sounds. We would be healthier

Top, left, testing hearing ability; right, measuring sound reflected into "mike" from insulated wall. Below, tuning fork shows efficiency of spring clip for "floating" wall

and happier if she had. At a meeting of boilermakers seventy-five out of 100 men couldn't understand their speaker because of occupational deafness, a malady caused by exposure to incessant sound.

Noise is sometimes stimulating but most of us work and think best in quiet surroundings. Part of the acoustical engineer's job is to reduce noise levels and insulate against machines that we use, and part of his job is to devise protection for the ears similar to the

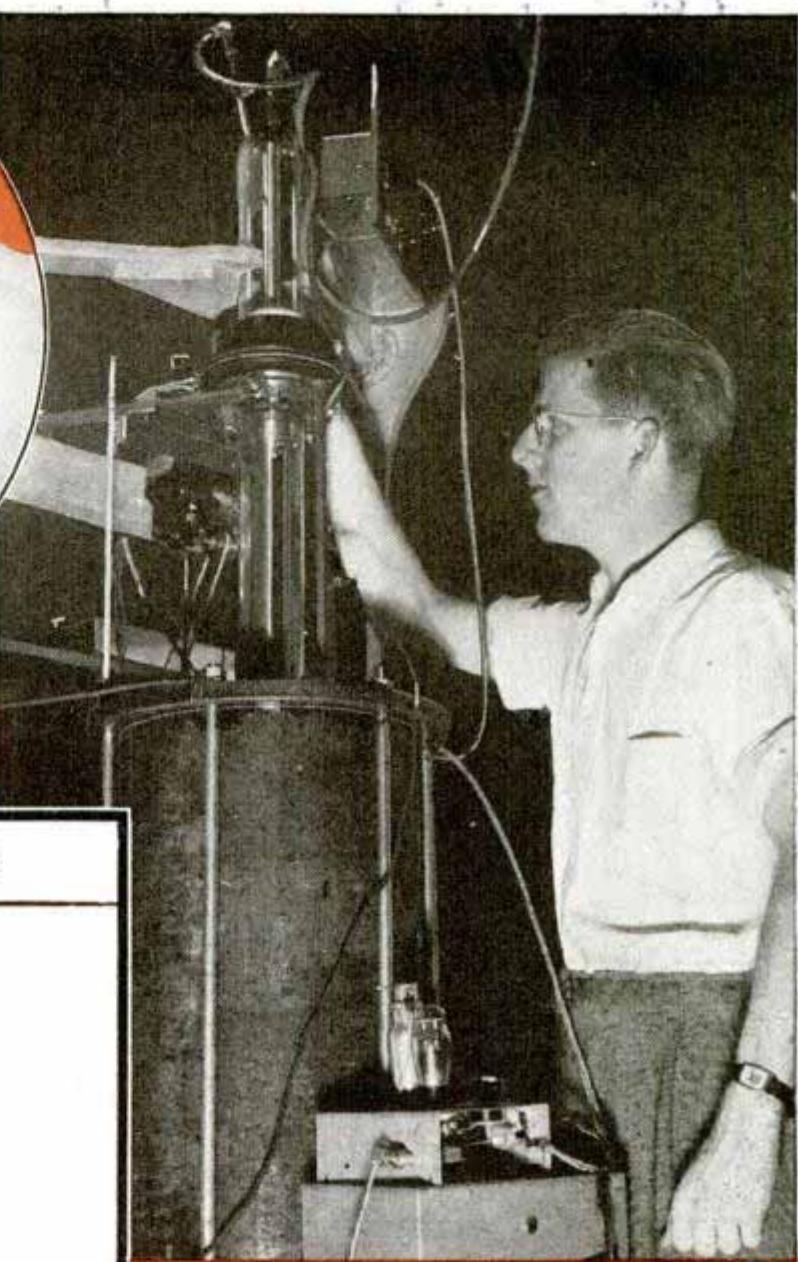
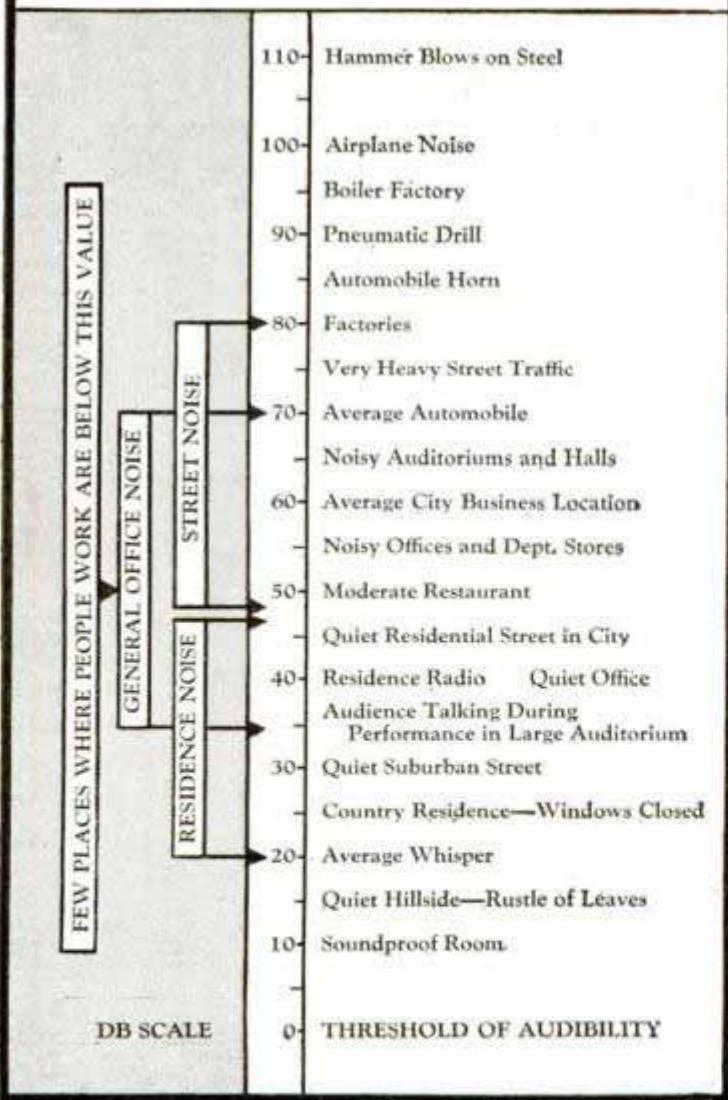
protection that dark glasses afford the eyes.

These objectives are being rapidly accomplished. The golden age of sound is not far in the future and it promises a richer and more comfortable life for all. Magnificent new music undreamed of in the past is a likelihood, better aid for those who are hard of hearing is a certainty, and relief from unwanted racket is assured.



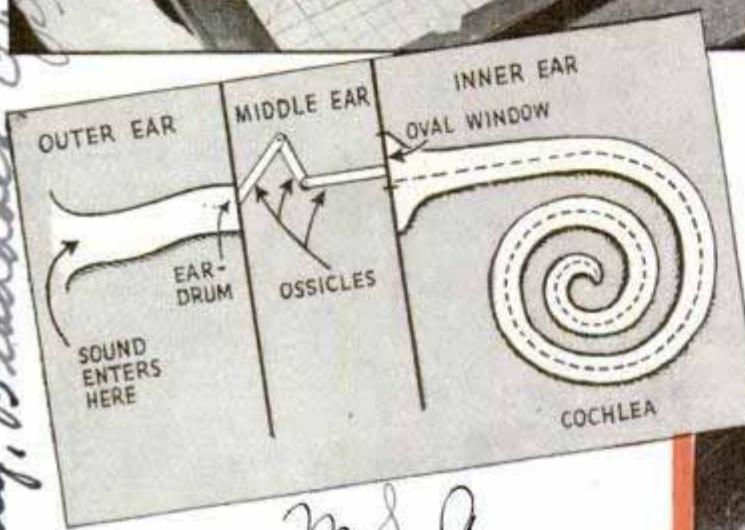
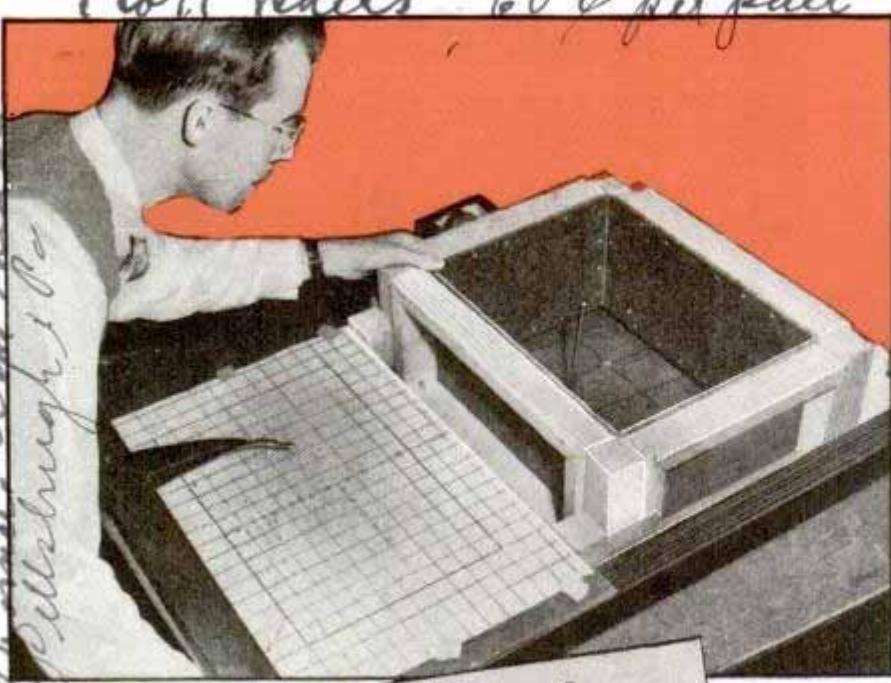
SOUND

VARIOUS NOISE LEVELS



Upper left, experimenting with hearing aid; right, measuring sound transmission in gas. Various gases humidity and temperature all affect the distance sound travels. Below, decibel scale of common sounds

The last ten years, with their many developments in radio and talking motion pictures, have materially increased our knowledge of sound. Much has been learned respecting the insulation of buildings and rooms against noise and vibration. Bothersome reverberations from hard walls first led us to drape blankets on the walls of a radio studio with the result that the room was "dead," especially for the higher-pitched tones, and sounds were flat and uninteresting. In a modern radio studio the walls and their insulation are carefully chosen with the idea of permitting some reflection of sound. This gives brilliance and interest to music and speech.



M.S.A.

Needless noise is a nuisance that impairs the hearing of millions of factory workers and that robs city dwellers of quiet and sleep. Nervousness and ill health are aggravated by it. While suffering from the noise in a modern hospital the writer devised an "ear defender" that protects the ears from bothersome sounds. The ear defender is a scientifically designed plug that is inserted in the ear canal; it consists of a soft rubber tube having an outer plug of heavy metal separated by an air space from an inner plug of soft rubber.

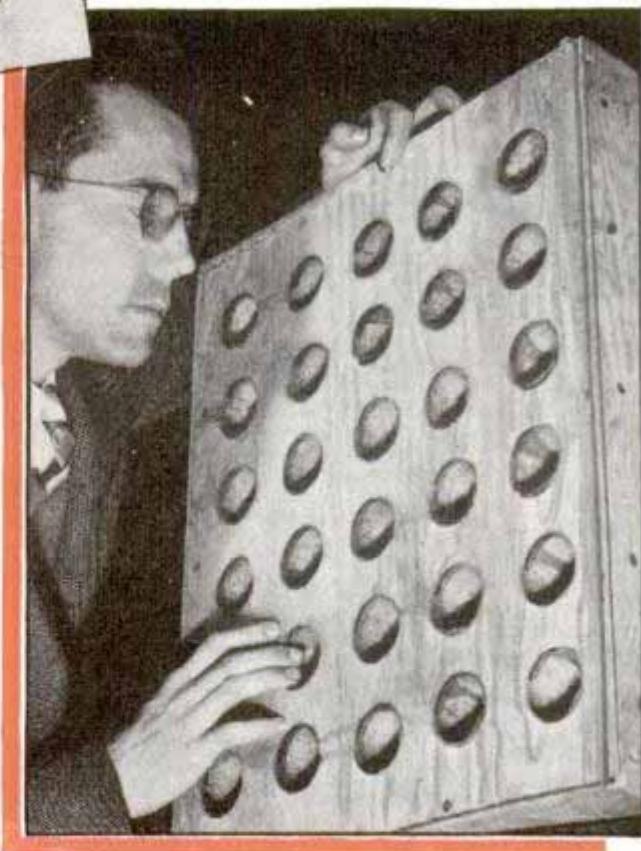
Simple wax or rubber stoppers in the ears reduce noise to about one-fifth its original loudness. The new ear defenders reduce sounds to about one-tenth their loudness, an average insulation of from forty to forty-five decibels. A roaring airplane motor becomes no louder than the noise in a restaurant. Restaurant noise is reduced to a whisper. I carry a set of the plugs with me to sleep soundly on trains

and to help me concentrate when a loud radio is being played in the next room.

Such ear defenders are not a cure-all for some factory workers because the insulation is only against air-borne sounds. The bones of the body conduct some noise and also conduct sub-audible vibrations. Workers exposed to such vibrations should sit or stand on insulating cushions.

One odd thing about wearing ear defenders in the presence of loud continuous noise is that they do not interfere with understanding conversation. This is because a speaker whose ears are unprotected normally raises his voice above the background noise in order to be understood, and his voice still remains

(Continued to page 132A)



Top, high-frequency sound measurements show noisiest areas in model room; center, diagram shows how bones in ear transmit sound. Bottom, sound is reduced to 1/10,000 strength by trap in air duct

Old Wagon Wheels Made into Trim Furniture



Above, flowerpot and book ends made of wagon-wheel parts. Upper right, seat and footrest. Below, trim glass-covered table with book shelf beneath

From old wagon wheels, hubs and other parts, a Californian fashions beautiful hardwood coffee tables, flowerpots, book ends, center tables, mailboxes, seats, footrests, lamps and other useful items for the home. First he dismembers the wheel, removing all spokes and prying loose the rim. Then each part is tested. All rotten wood is dressed off with a sander and then the pieces are reassembled. If he is making a center table, the salvage materials consist of one heavy wheel with a four-inch rim

and two large hubs, one of which is sawed in half, leaving the spokes all on one side. Spokes of both hubs are then cut to about eight inches in length and the full hub and two half hubs are fitted together. The end without spokes is used to support the surface of the table, the end with the spokes is used as the base. The full hub goes between the two and its spokes serve as a center shelf. The surface of the table generally is a circular piece of plate glass which fits on top of the large wheel.

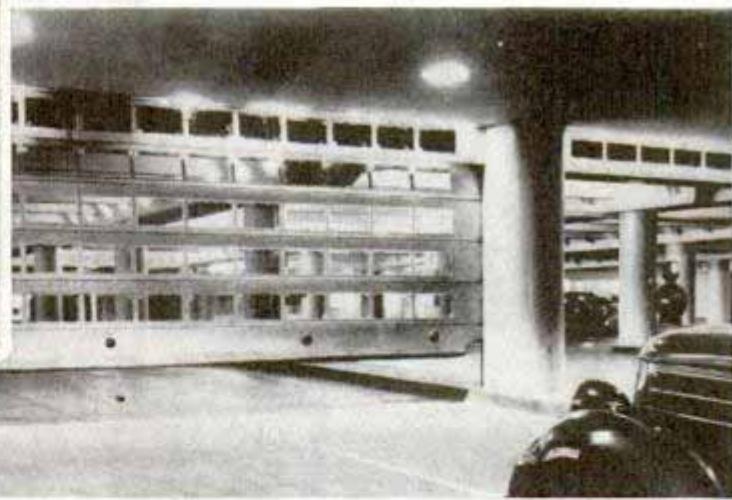
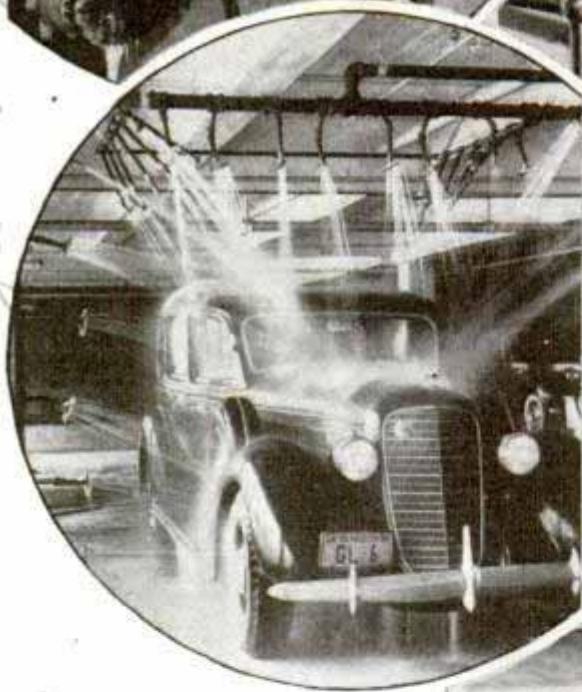
Jack Sahr, 11119 Ventura Blvd.

205

Automatic Garage Speeds Up Car Service

De luxe parking is offered to guests who drive their own cars to Rockefeller Center. Six floors of the New York skyscraper,

three of them below the street level and three above, have been turned into an air-conditioned garage, providing room for 800 automobiles. Sealed throughout and with no open windows, the entire space is maintained at uniform temperature and the air-purifying system eliminates gas fumes and dirt. For washing cars a special soap is applied through a brush fed by a hose, followed by a shower bath to rinse them. Motorists open entrance doors automatically by driving over contact plates. Firehouse poles between floors are used by the attendants.



Top, right, attendant sliding pole holds ticket in his mouth; left, hose-fed brushes. Bottom, left, auto under shower; right, doors opening as car rides over contact plates

© Haloran

Forest Fire Every Two and One-Quarter Minutes Is U. S. Average

During the calendar year 1938 there were 232,229 forest fires in the United States, or an average of one every two and one-quarter minutes, according to a summary by the forest service of the U. S. department of agriculture. These fires combined to burn over 33,815,100 acres—an area almost as great as that of Arkansas—and caused damage estimated at \$36,888,460.

Ninety-one per cent of the acres burned over were on unprotected private land, and the remaining nine per cent were on land under federal, state or private protection. Of 659,202,090 acres of land needing protection, 158,883,850 acres of private lands are unprotected. Statistics show that 82.7 per cent of fires on protected lands were caused by man, 8.6 per cent by lightning.

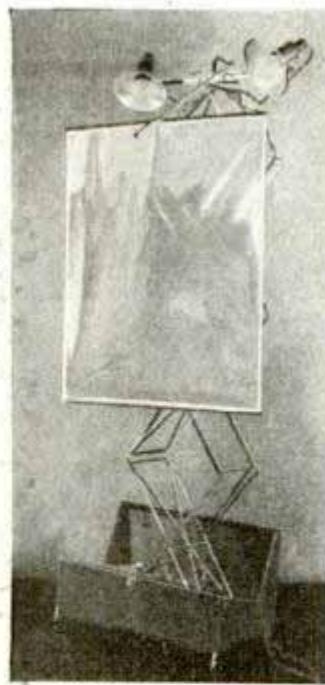
Curt. Andrew H. Haloran, 8747-83rd St.
Jackson Heights, N.Y.

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How Stunt Man Leaps Is Revealed by Camera

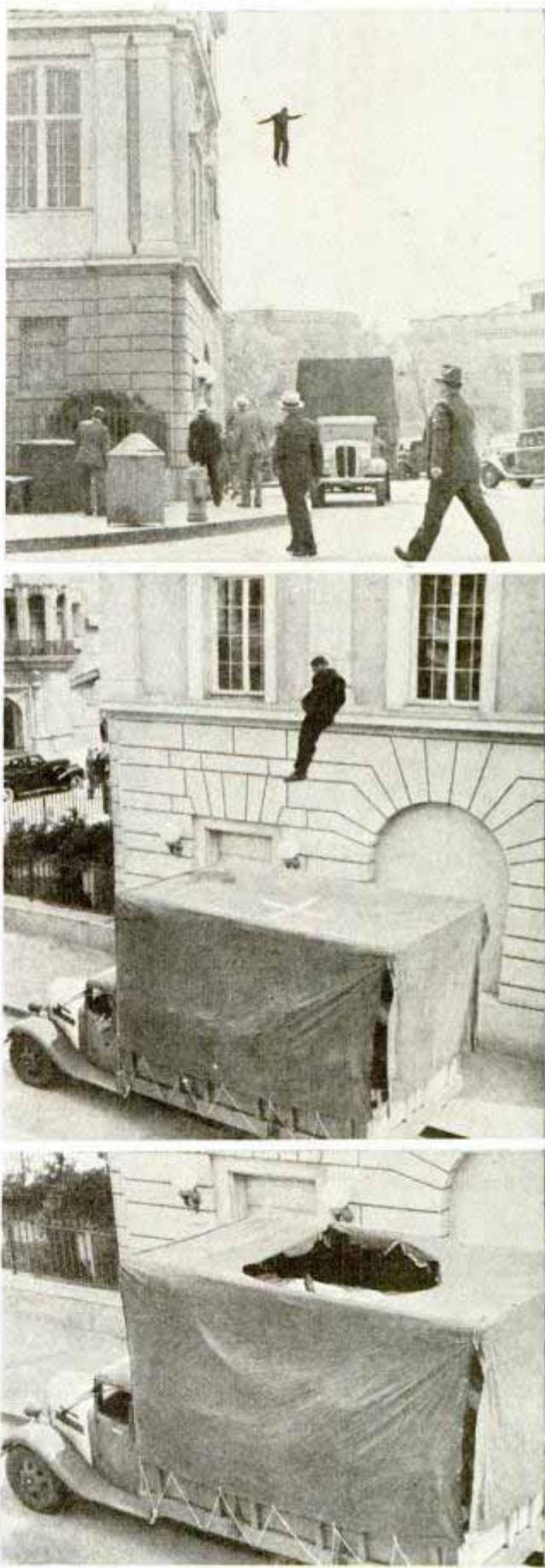
Leaping from a window more than forty feet above street level into a truck is one of the thrillers in a recent movie. How a stunt man, substituting for the principal actor, made the jump without injury is revealed by photos snapped by several photographers shooting from different points of vantage. At \$500 per jump, it was a one-take affair for the motion picture and the whole cast was jittery, but the stunt man, Loren Riebe, made a beautiful leap from a third-story window, shot outward and down at the "X" marked on the fabric-covered top of the truck, crashed through and landed on a pile of mattresses. He didn't even suffer a sprain. The stunt man was traveling 516.27 feet per second as he went through the canvas top of the vehicle. Stunt men frequently make leaps from forty feet or more in the air, but the landing place—a truck roof eighteen feet out from the wall of the building, made this job more hazardous than usual.

"Jack-in-the-Box" Photo Lights Lift to Almost Eight Feet



Capable of being raised from floor level to any height up to ninety-four inches, a set of photographic lights and a diffusing screen are packed in a carrying case that forms a base for the unit when in use. A lifting device stops at any intermediate point without fastening. The two lamps can be separated horizontally from eleven to thirty-six inches,

and there are adapters for smaller flood-lamps. Casters on the case facilitate moving the unit about. When the case is closed for carrying it measures nine by ten by thirty inches. It weighs twenty-three pounds.



Series of pictures reveal how stunt man of movies hit the mark in leap from third floor of building

Exploring A TROPICAL

C. B. Perkins
Herpetologist, San Diego
zoo
Lg 6381 / Holly wrote Blvd.

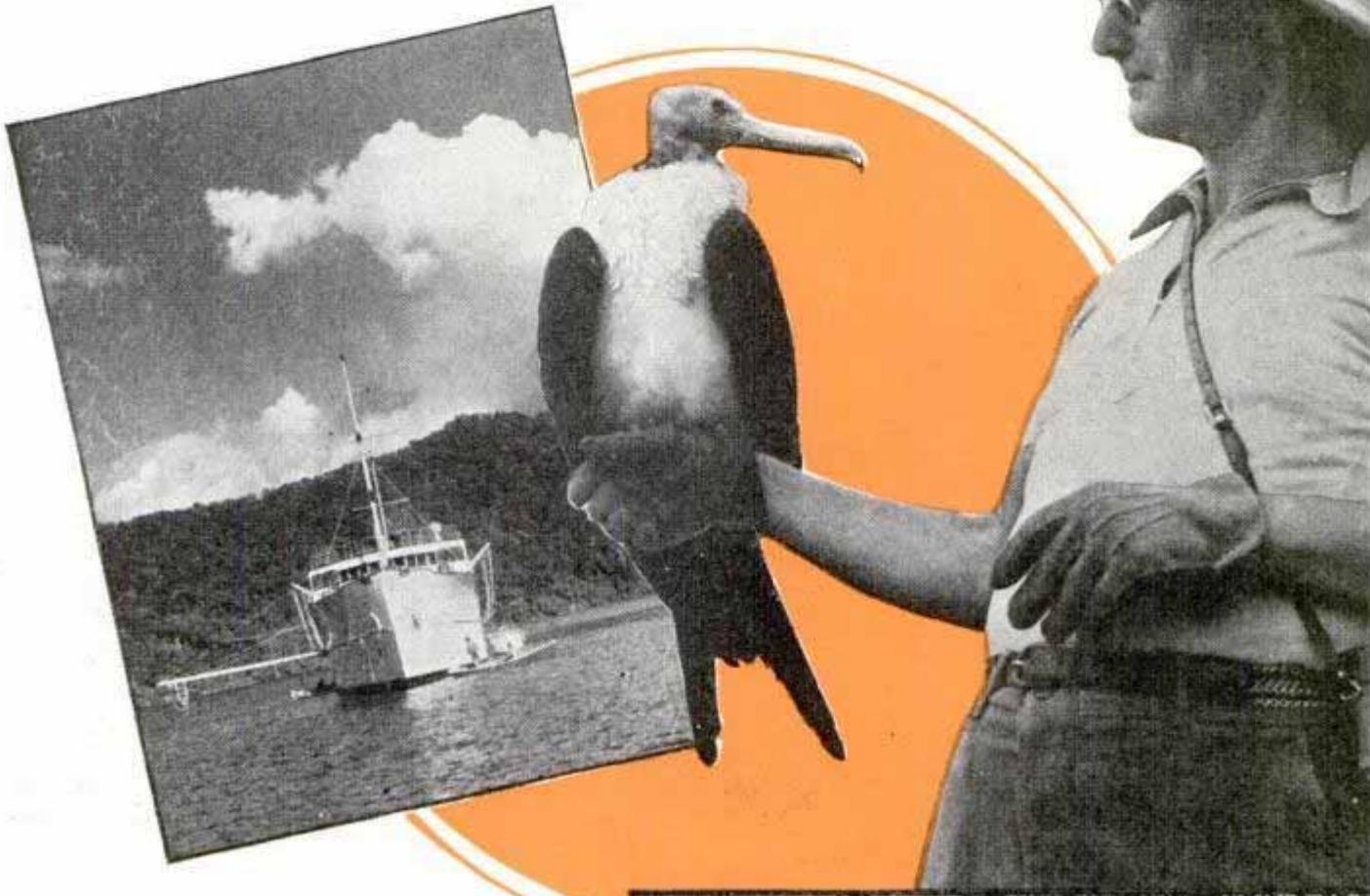


Top, a scientist makes acquaintance of a land iguana in the Galapagos. Below, map of recent cruise. Right, underside of sea star showing tentacles extended, and sea urchin (circle) with poisonous spines

BIRDS that stand over their nests to shade their eggs and keep them cool, queer forms of life dredged up from the sea that resemble mushrooms armed with teeth, birds the size of turkeys that appear to have been freshly plucked and that are actually babies, larger than their parents—these are some of the odd specimens collected on voyages of the "Velero III," the scientific exploration ship of the Allan Hancock Foundation for Scientific Research at the University of Southern California.

Blue-faced boobies of the Galapagos Islands are the birds that protect their eggs

WONDERLAND



from the intense midday sun. The strange mushroomlike forms from the sea bottom are a new mystery to scientists who are still trying to decide whether the specimens belong to the animal or vegetable kingdom. The large naked birds are young tropical pelicans that are so well fed by their parents that they temporarily outstrip them in size.

In the tropics the scientists on the "Velero III" cruise for miles through patches of ocean turned bright red by countless microscopic plankton. At night they read newspapers by the glowing phosphorescent light of the disturbed water in the ship's wake. Visiting Cocos Island, they hunt for new species of marine life instead of searching for the legendary pirate treasures supposed to be buried there. Along the coasts of Guatemala and San Salvador their passage is lit by the ruddy



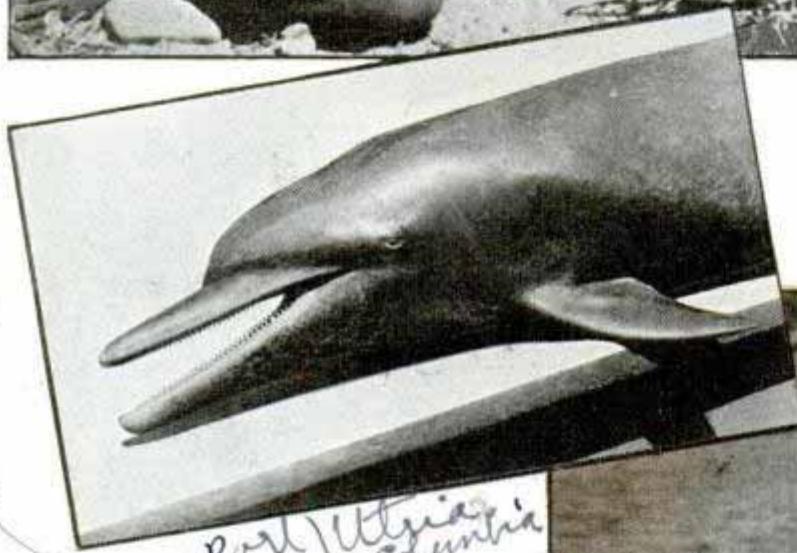
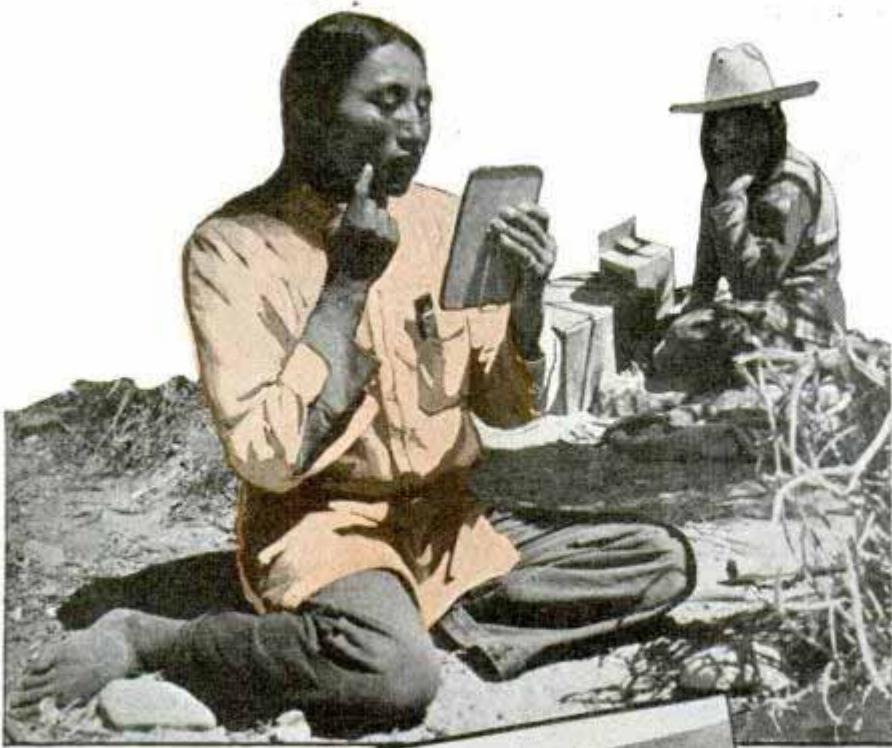
Photos courtesy Allan Hancock Expeditions

Velero III, exploration cruiser, at anchor in tropical Port Utria, Colombia. Right, Capt. Allan Hancock, master of the ship and expedition director, with a young man-o'-war bird.

Below, collecting freshwater fish on Cocos Island

Mr. George S. Myers, Costa Rica
Natural History
835

on Tiburon Island, Mexico



port Victoria Columbia
Seri Indian chief, top, applies "makeup" with ten-cent-store mirror presented by visitors on Tiburon Island. Center, rare porpoise with ducklike bill. Below, examining haul from dredge

glow of smoldering volcanoes. They anchor in uncharted coves off Ecuador and Colombia to study native tribes.

The scientists visit the Bird Islands off Peru that are glistening white in the sun when the bird population is out fishing at sea and that appear to be black masses later when the vast flocks of birds return and cover nearly every square foot. To the scientific world the tropical Pacific is a zoological and botanical wonderland only partially explored. Both on land and in the depths of the sea new and unusual forms of life are still being discovered. In the jungles and arid wastes are fish-eating bats, um-

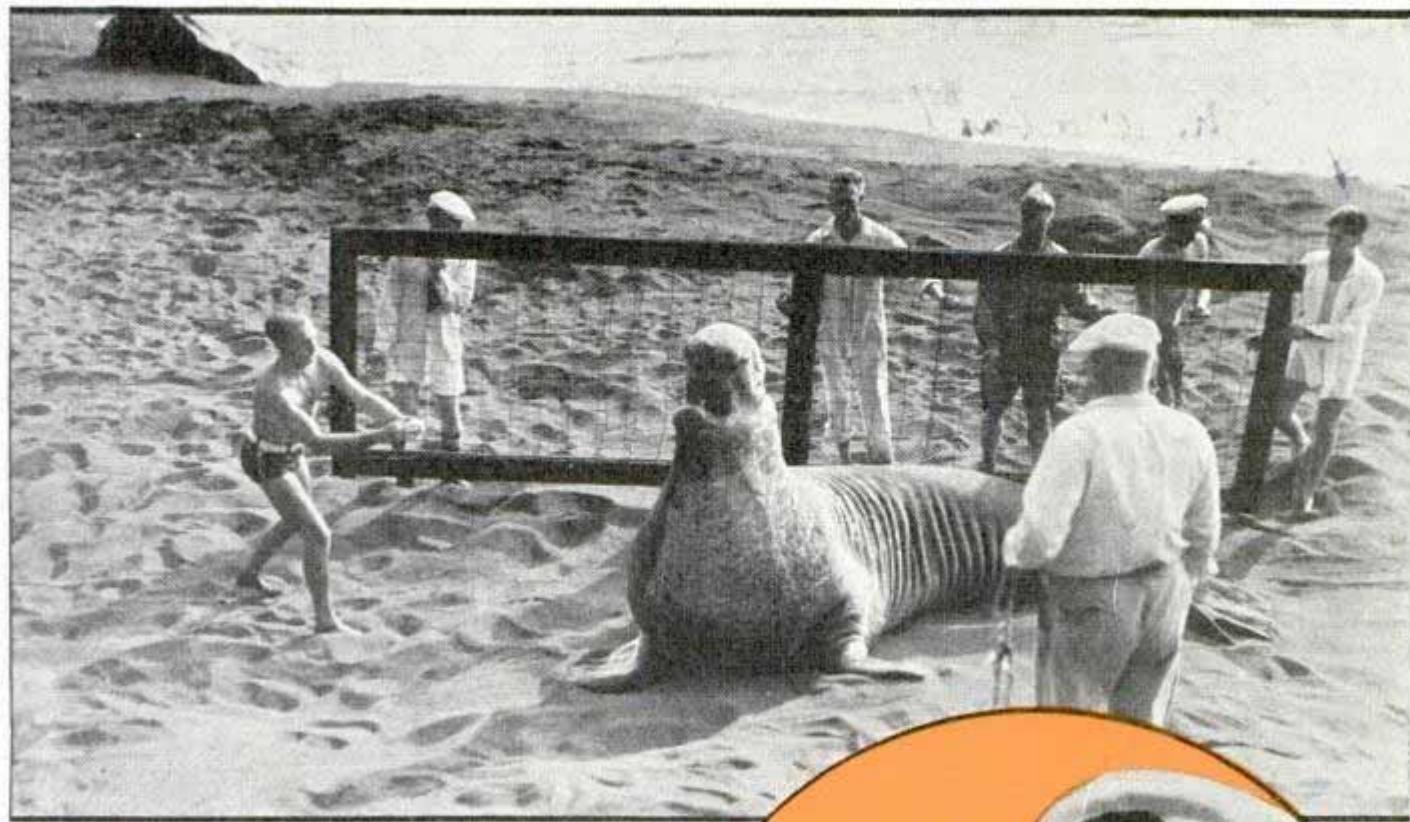


tain Allan Hancock of Los Angeles, who serves as navigator and director of the expedition. Among the institutions that have participated in the voyages are the United States National Museum of Washington, D. C., the Field Museum of Chicago, and the University of Michigan. Each year, with college students as part of the crew, at least one voyage is made into the tropics.

The "Velero III" is a sturdy 198-foot

brella ants, and rare reptiles. The toad fish that walks on the bottom of the sea with five-toed fins, rare black shrimp and club-footed sea urchins are only a few of the strange forms of marine life.

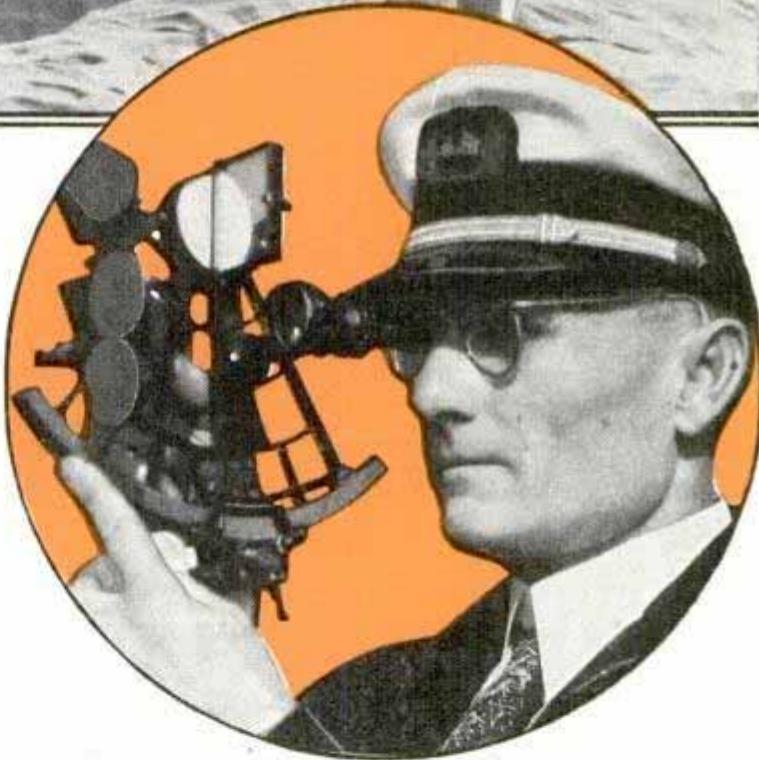
Not only because of their interest in exploring the unknown but because of the expectation that some of the research will contribute directly to the welfare of mankind, faculty members of the University of Southern California and distinguished scientists of other institutions are engaged in a comprehensive study of lonely areas in the eastern Pacific. They carry on their work from a ship built especially for research, presented to the school by Cap-



Diesel cruiser carrying fuel for a 10,000-mile voyage. The vessel is a floating laboratory with work-rooms where specimens may be studied, air-conditioned storage rooms, photographic darkrooms, heating and cooling systems for maintaining the proper temperatures for specimens brought back alive. The ship carries four power launches and skiffs for landing on rugged coasts.

Specimens collected range from microscopic organisms to 1,200-pound "pug-nosed" Peruvian sea lions brought back for zoos. Motion pictures are made of strange animals. In the tropics the photographers keep their film in refrigerators because of the heat and humidity. For close-ups of animals and birds they can usually walk right up to their subjects, which are not afraid of humans.

Archaeological notes are made ashore, geography and chemistry of the sea are studied, and salinity and temperature data at various locations and depths are gathered for the Scripps Institute of Oceanography. Parts of the sea bottom along the west coast of Central America are shifting because of earth disturbances, and the ves-



Top, crew of the "Velero III" net a big bull sea elephant on Guadalupe Island, Mexico, then buoy it out to sea and hoist it aboard ship for San Diego. It weighed 3,000 pounds. Below, Captain Hancock is navigator of the expedition vessel

sel charts the latest changes with its electric fathometer.

With so many fields under investigation, discoveries are made on every trip. On one voyage Dr. Hubert Lyman Clark of Harvard University found evidence of the odd life cycle of one brittle starfish that starts life with six radial arms and can break into two separate animals with three arms each, after which each half grows two additional

(Continued to page 130A)

Rubber Fins Worn on Feet Increase Swimmer's Speed



Swimmer almost doubles his speed in water by flipping these large fins to duplicate action of tail of fish

Artificial fins, like those used by fast swimming natives of the South Seas, are about to become available to swimmers in this country. The fins are made of rubber and are attached to the swimmer's ankles. Swimmers wearing rubber fins can travel through the water at almost double the speed of a fast crawl-stroke swimmer.

Harvester Cuts and Threshes in One Operation

Operated from a power takeoff of a one-plow size tractor, a new all-crop harvester cuts and threshes at the same time, combining the work of binding, shocking and threshing into a one-man job. Amply large

Model 40.



Versatile streamline combine, with forty-inch cut, can be adjusted to handle more than 100 grains, peas and seeds

for the average farm, the streamline machine features a forty-inch cut, wide bar cylinder, and rubber shelling contacts with simple adjustments for more than 100 grains, peas and seeds. With it farmers can harvest valuable seed, like soybeans, clover, alfalfa, vetch and grasses of every kind, thus encouraging the growth of legumes and grasses that help build soil fertility, soak up rainfall and stop erosion.

J 964

Giant Likeness of Small Camera Forms Store Front

Camera fans are attracted to a Los Angeles store front constructed in the likeness of a miniature camera. To complete the



Store front, in likeness of miniature camera with all attachments, displays photographic accessories

advertising stunt all the attachments of standard cameras have been added, including a lens, shutter, view finder, film winder and dual range finders. Especially interesting is the lens, which serves as a show window in the day and as a screen for projection of amateur movies at night.

J 1067

Stratosphere Boiling Hot Meteor Tracks Indicate

At about thirty-eight miles above the earth's surface, temperatures have been found to reach 212 degrees Fahrenheit, the boiling point of water. This discovery was made by Dr. Fred L. Whipple,

*Syndicate Service
Sept 13*

Harvard astronomer, who uses a new type of "meteor speedometer" which tells temperatures in the stratosphere from tracks made in the sky by shooting stars. A fan blade revolving in front of a telescope-camera breaks at measured intervals the path of any meteor that flashes across the field of view. Two such thermometers, located twenty-four miles apart, give an accurate measurement of the meteor's height, brightness, velocity and deceleration. Ordinary room temperature of sixty-eight degrees Fahrenheit was indicated at the seventy-mile height.

Cast-Iron Blocks for Pavement Made with Low-Grade Ore

With an eye toward the creation of an outlet for vast quantities of low-grade ores in iron ranges of the state, the University of Minnesota has developed a cast-iron paving block that can be manufactured from ores containing up to forty-five percent of oxides, not generally suitable for steel making. The hollow blocks, six by six inches square and one and five-eighths inches high, are laid on concrete after it has set. Irregularities on the iron paving surface permit rapid drainage and help to remove the film of water from auto tires.



Laying cast-iron blocks in section of highway. Inset shows close-up view of their construction

Vinylite plastic Glass Bends and Stretches Without Cracking

see May 1940-1309



Showing how sheet of elastic glass bends without cracking. Belt and suspenders are of new material

Elastic glass, which will not scuff or crack in bending or stretching, is being used for making garters, belts and braces. It yields comfortably to body pressure, then eases back to its original shape. In its natural color the material is transparent, but it can be produced in translucent colors. Like ordinary glass, the elastic variety does not deteriorate, will not support combustion, is unaffected by water, perspiration and alcohol, and it cleans easily.

21110

Man Needs a Sixty-Pound Bite to Tackle a Tough Steak

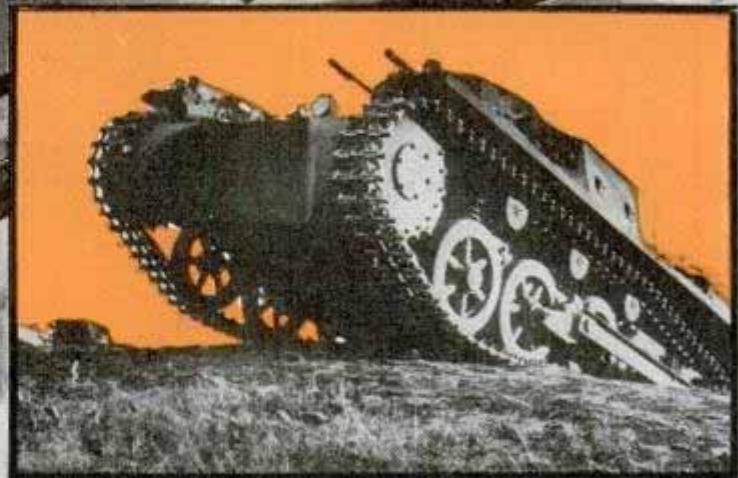
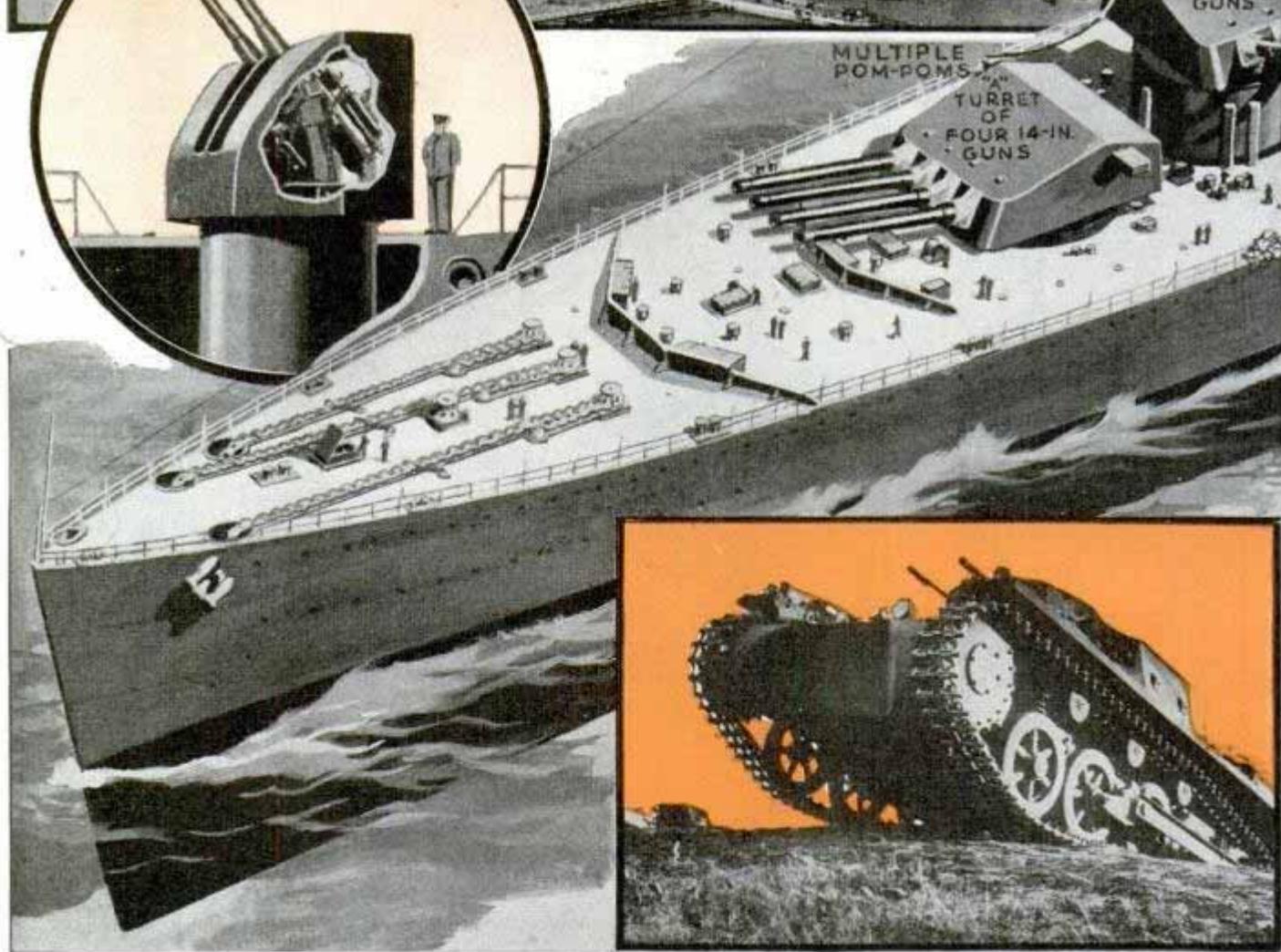
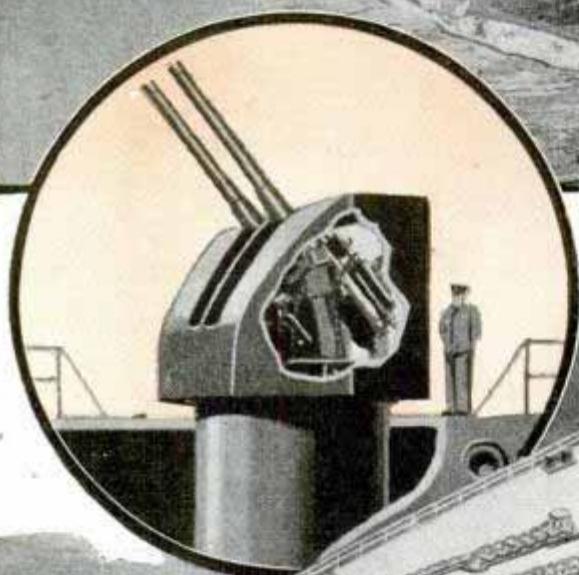
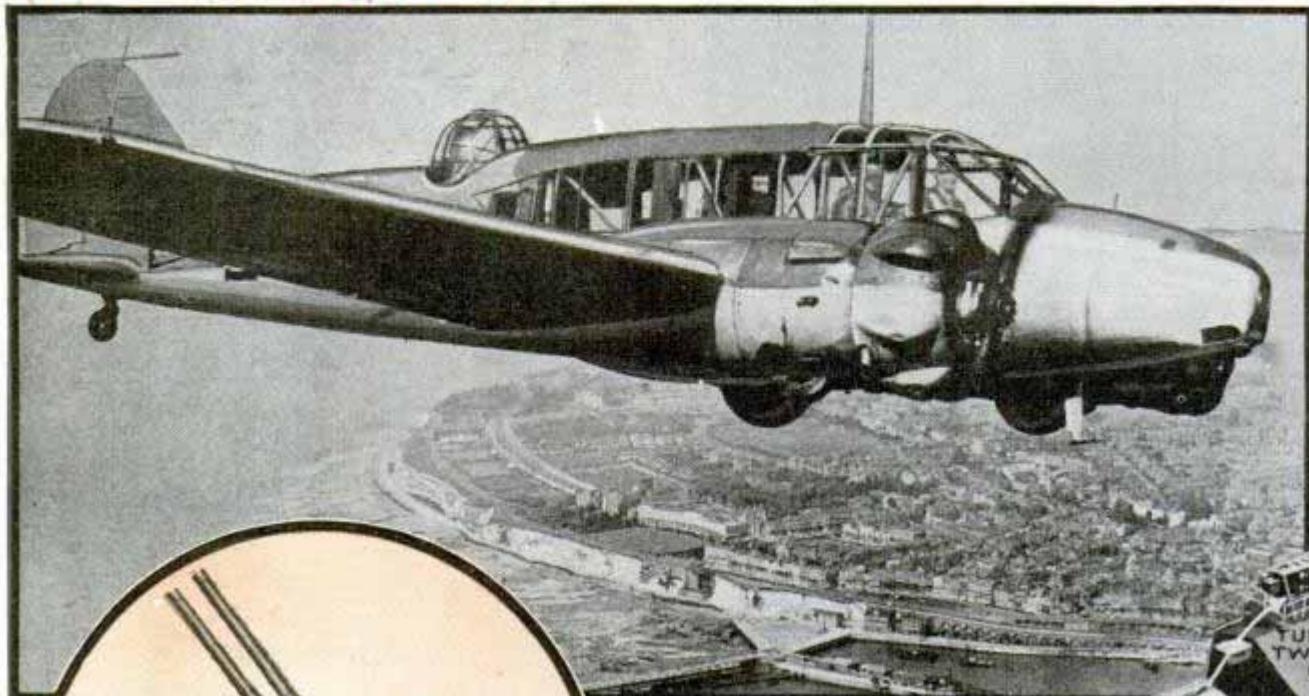
It takes a sixty-pound biting pressure to bite through a tough beefsteak, but fortunately man has the jaw pressure for the job. The power of the human jaw was demonstrated recently by Dr. Ralph H. Boos of Minneapolis before a dental convention. He used a gnathodynamometer, an instrument which measures biting power. He showed that normal biting pressure for a man is sixty to sixty-five pounds, for a woman, twenty-five to thirty pounds.

Chicago Tribune 9/29/3

School of mines

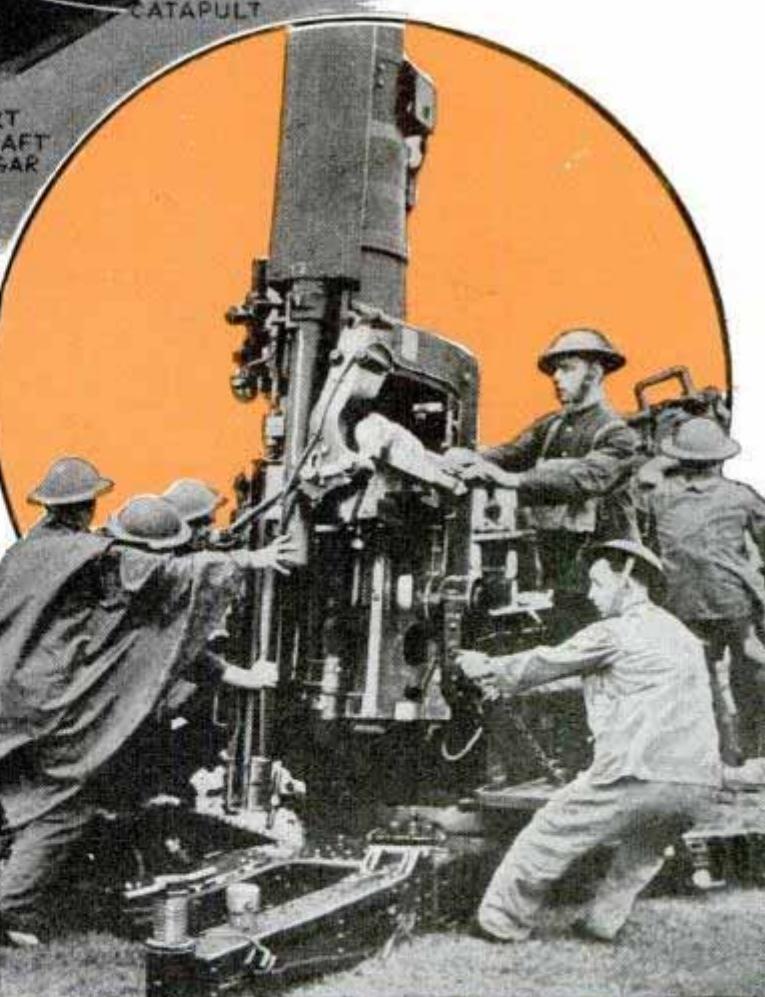
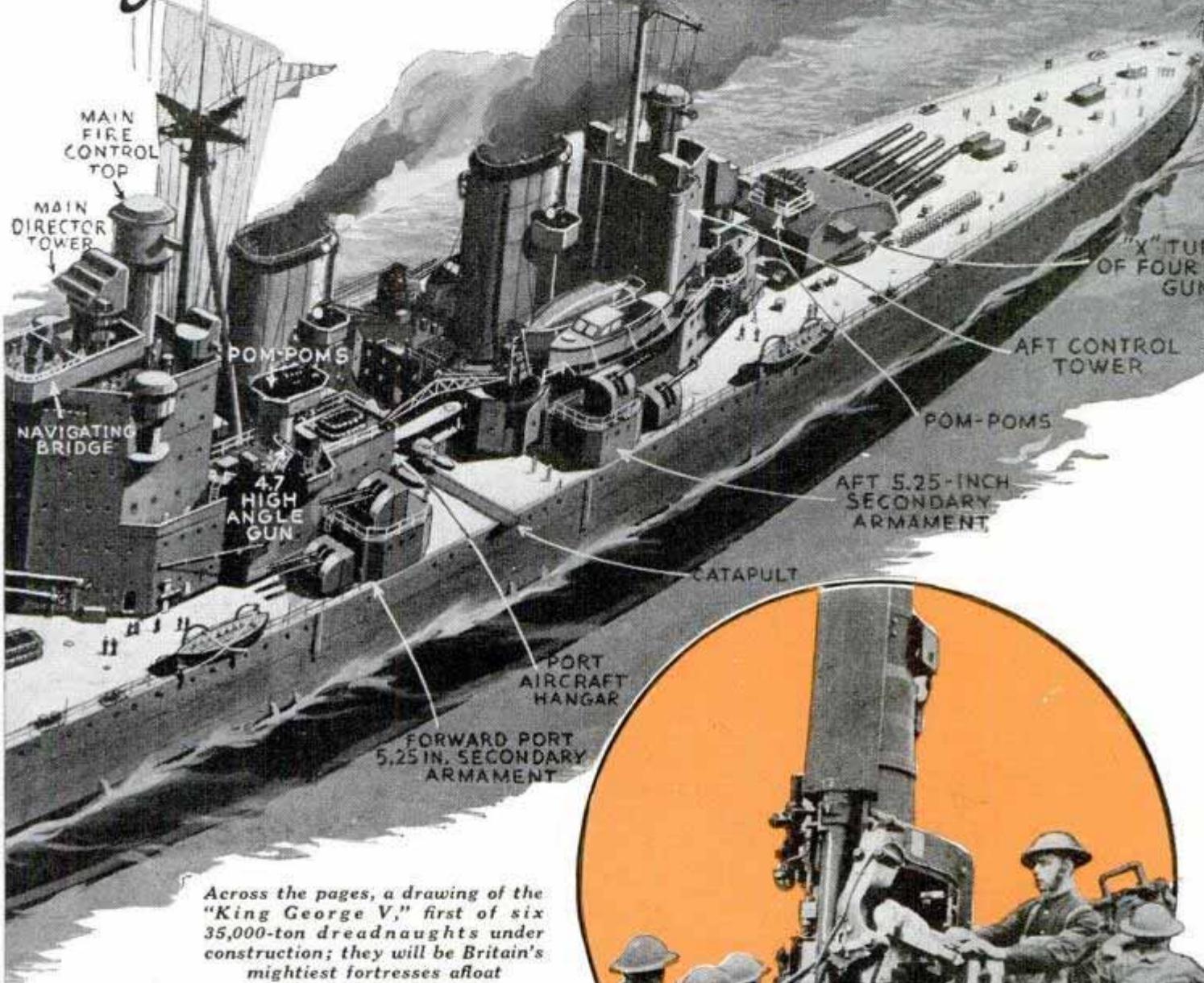
9/10/22. Wide World

WAR MACHINES



Outbreak of war in Europe turned loose fighting machines far more terrible in striking power, far stronger in defense than any hitherto used. On these pages are some of the modern instruments of battle. At top, a British bombing plane. Left, 5.25-inch guns in twin turret on Britain's newest battleship (center); guns can be elevated to sixty-degree angle. Bottom, latest high-speed German tank

of LAND, SEA and AIR

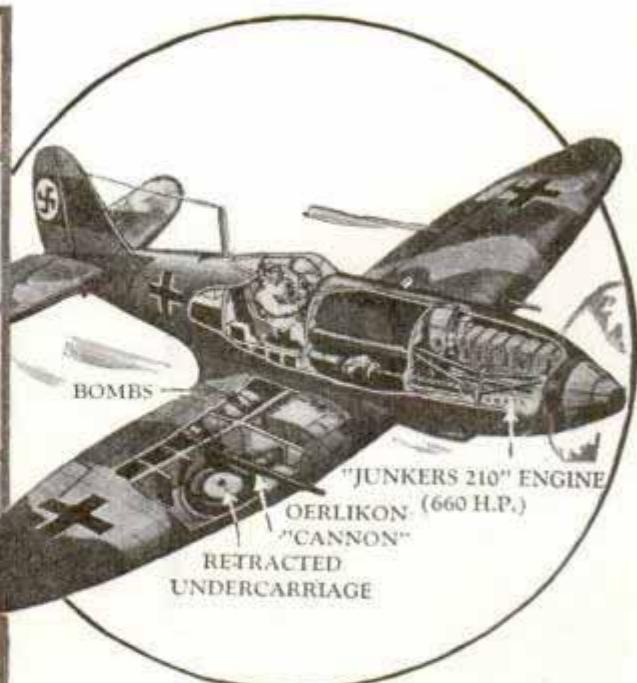
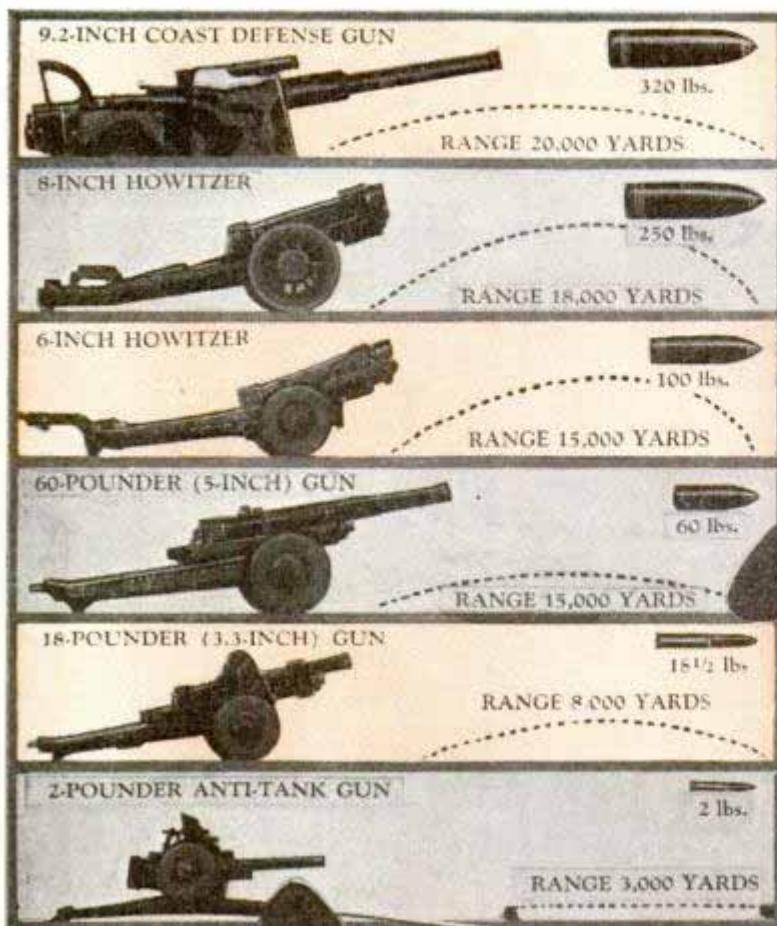


No big gun at all but an aircraft spotter, the range finder at left is a "big brother" of the focusing device on your camera. Above, anti-aircraft crew mans its highly mobile 3.7-inch gun, which can be pointed skyward at an angle of nearly ninety degrees

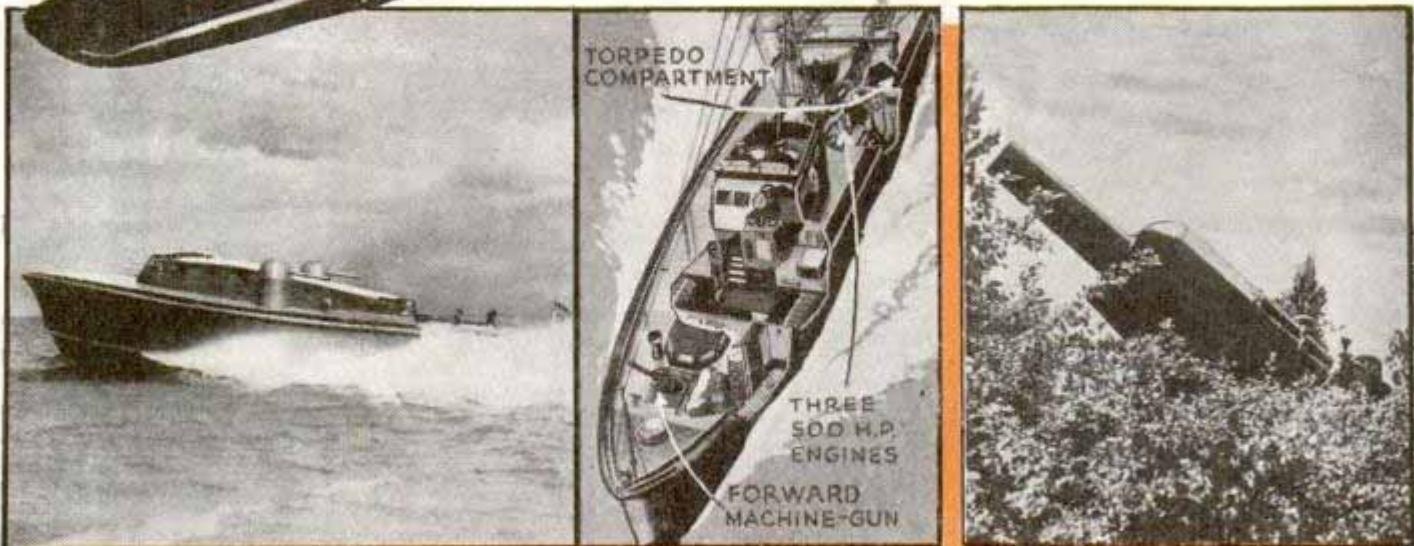
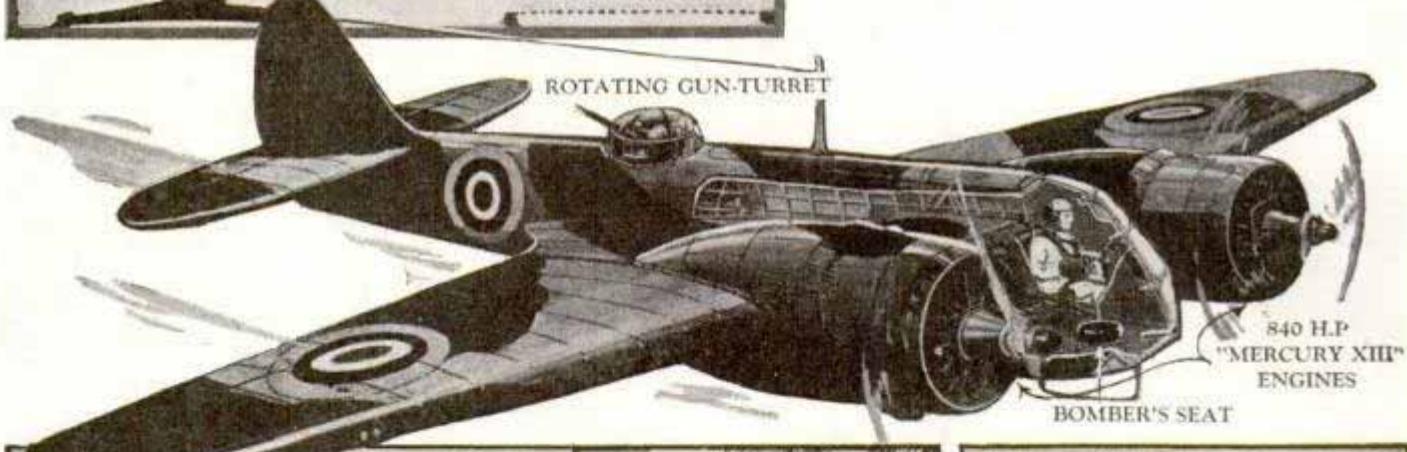
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POPULAR MECHANICS



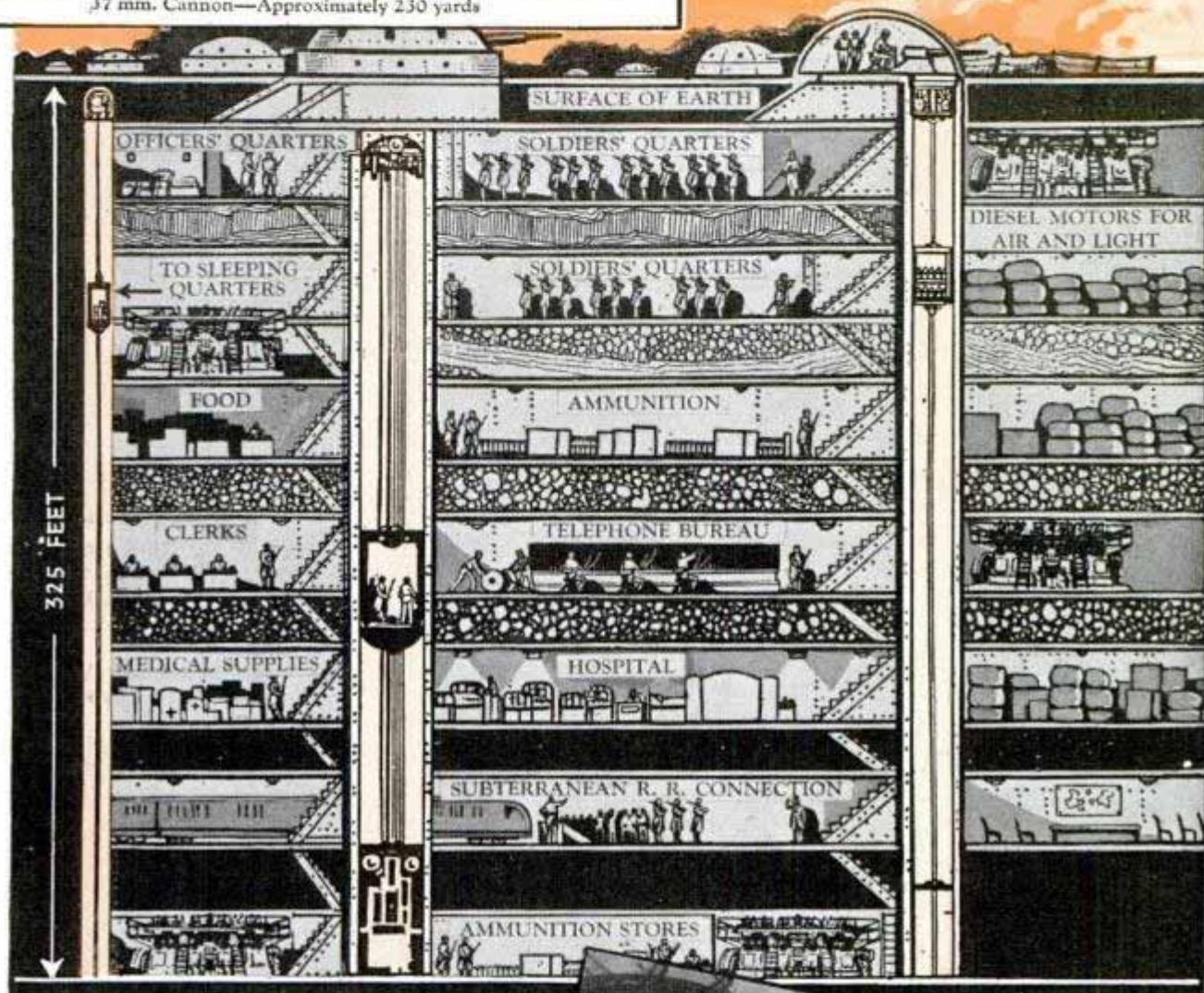
Approximate firing ranges of some of the principal types of army guns are shown at left. Heavily armed German single-seat bomber above can fly 685 miles at 276 miles an hour



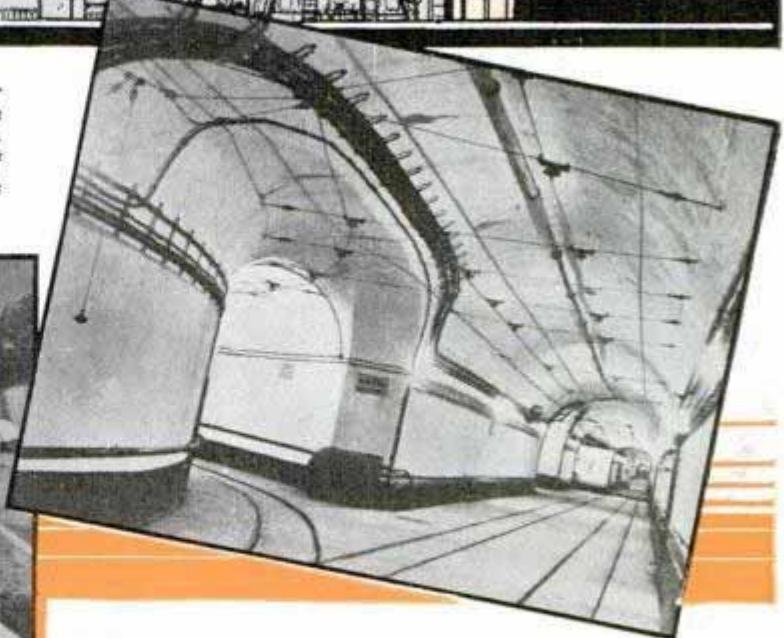
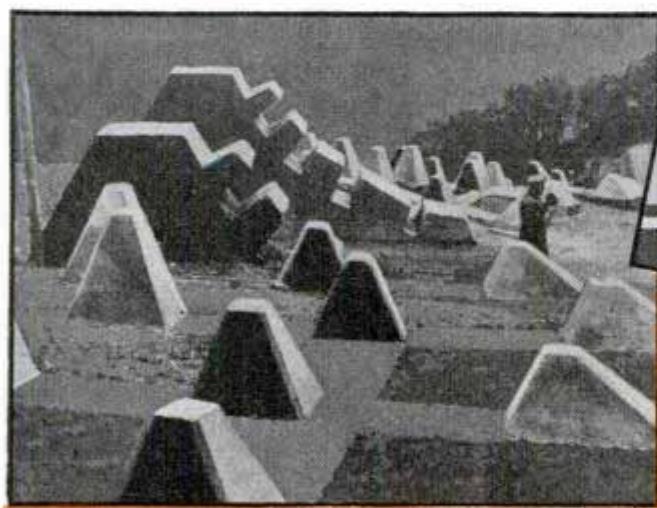
Ample glass area gives crew of British plane (center) clear visibility in all directions. Below, left, forty-two-knot British boat carries four torpedoes, depth charges and armor-piercing guns in turrets; center, another torpedo boat with anti-aircraft gun; right, big German gun hidden in brush

EFFECTIVE RANGES OF CANNON AND MACHINE GUNS COMPARED

-  Machine Gun—Approximately 30 yards
-  20 mm. Cannon—Approximately 100 yards
-  37 mm. Cannon—Approximately 230 yards



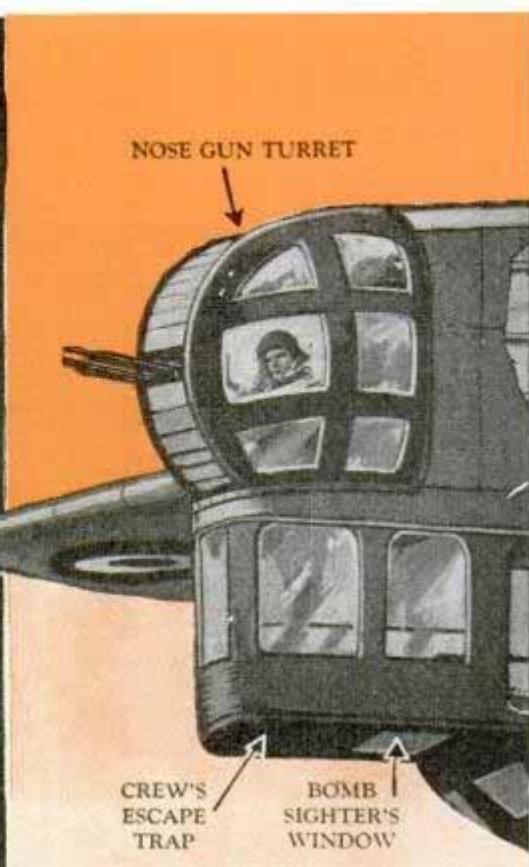
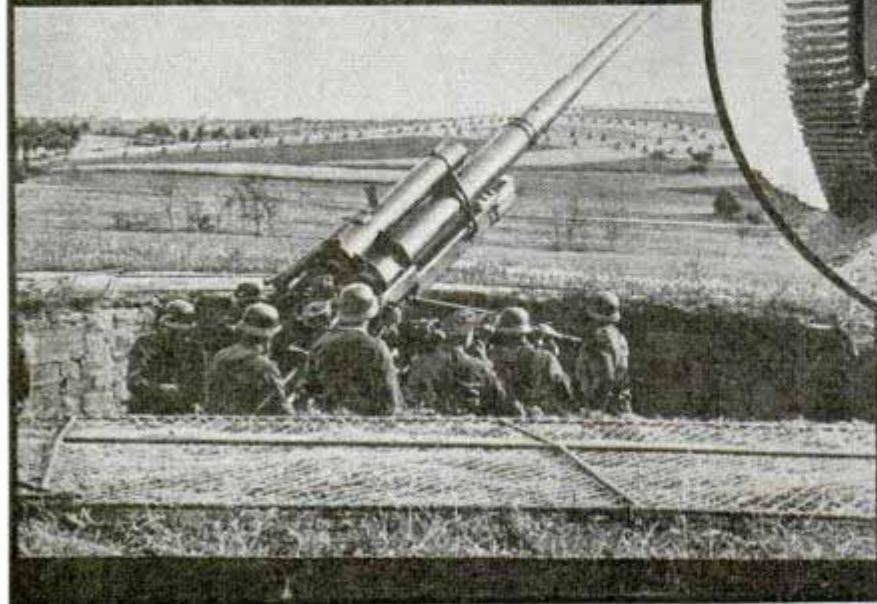
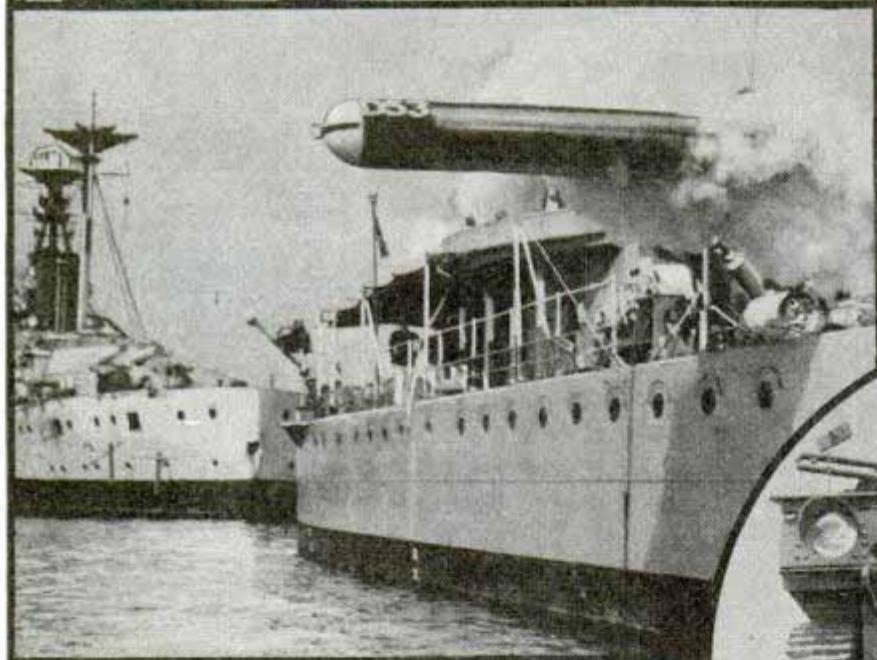
Airplane guns have relatively short effective range, indicated at top, but cannon shells explode on impact with highly destructive effect. Underground forts of Maginot Line protecting eastern France are sketched in cross section above



Electric railway 100 feet underground serves Maginot Line, above. Left, concrete traps built to keep enemy tanks from piercing Germany's Siegfried Line

9/10/22

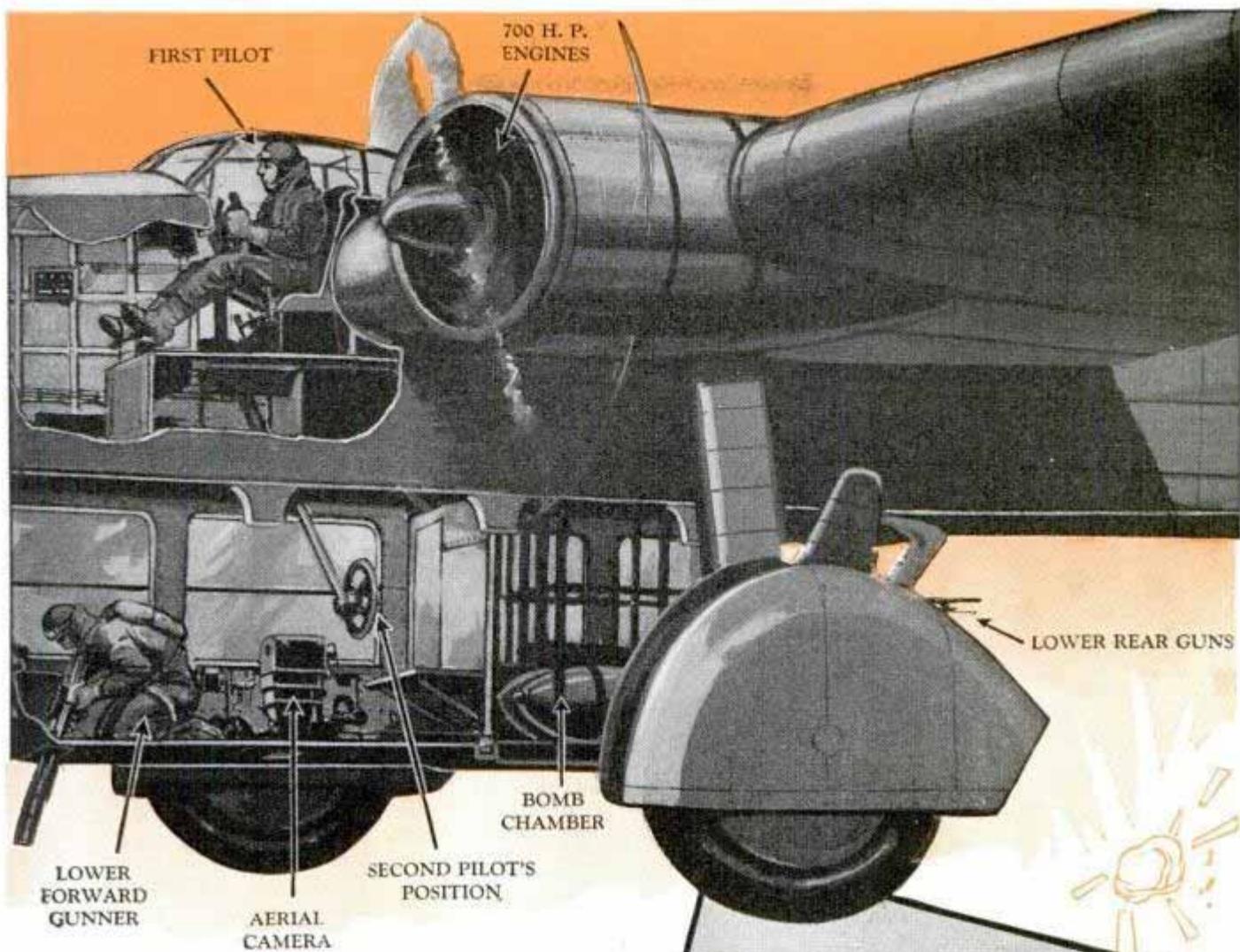
Wide World



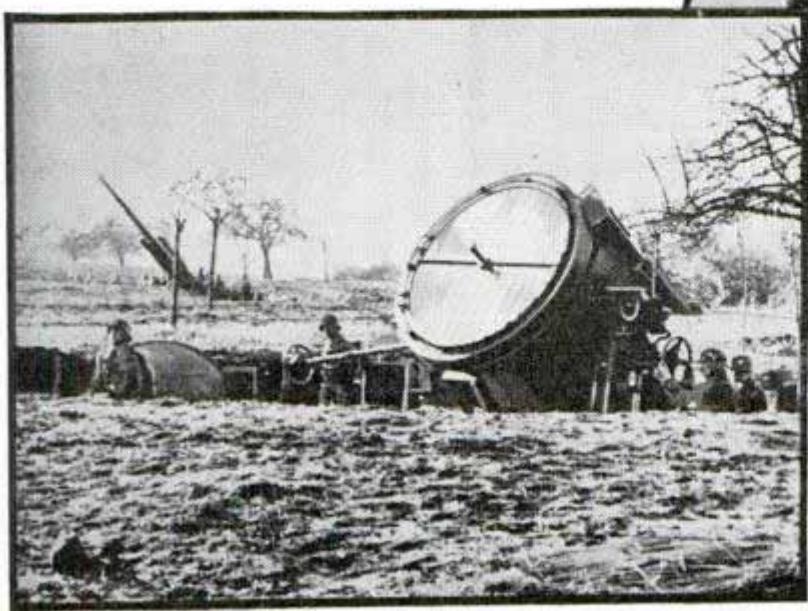
Mechanization of war has introduced hundreds of armored tanks, tractors and trucks such as the light tractor below, attached to British artillery unit



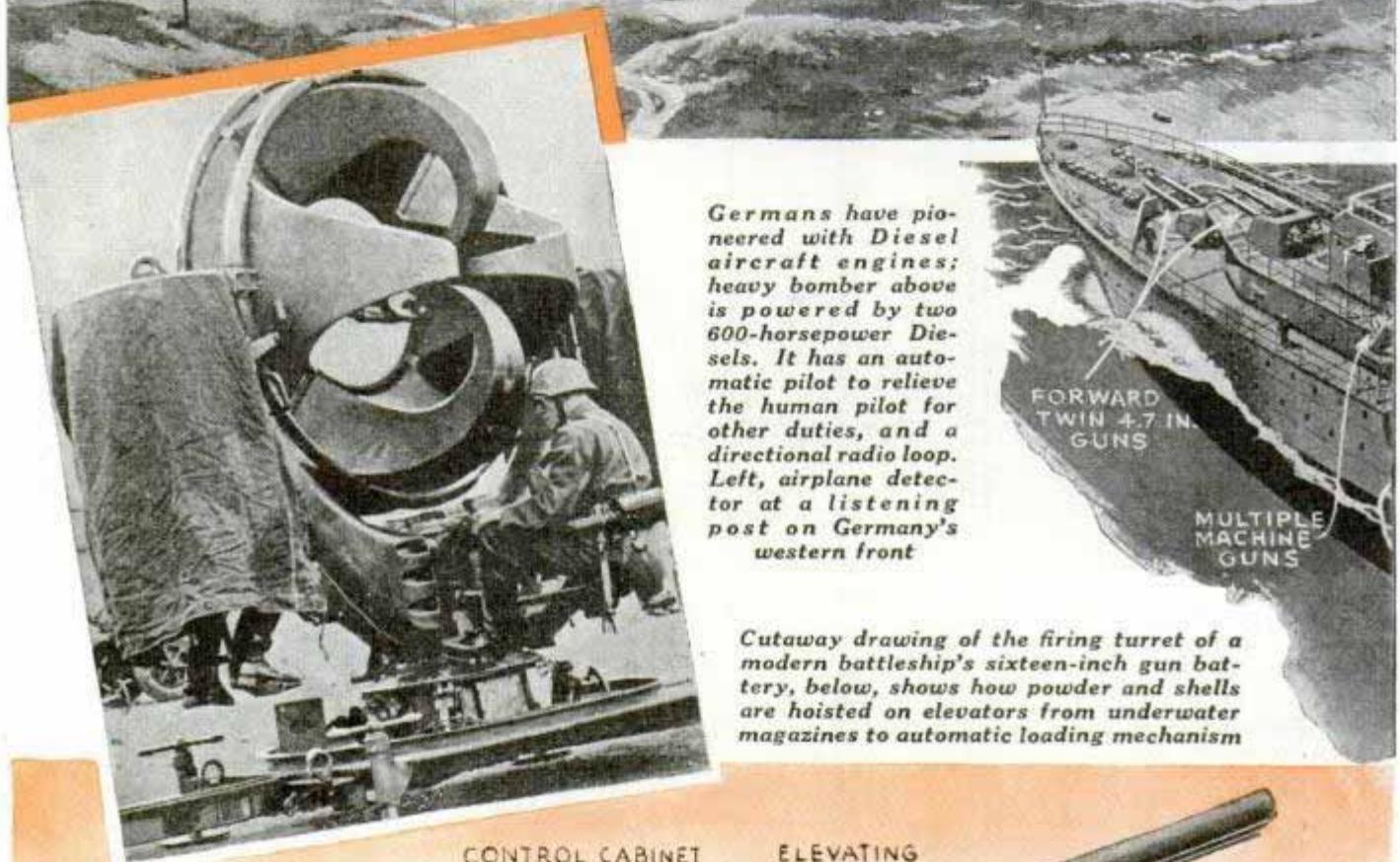
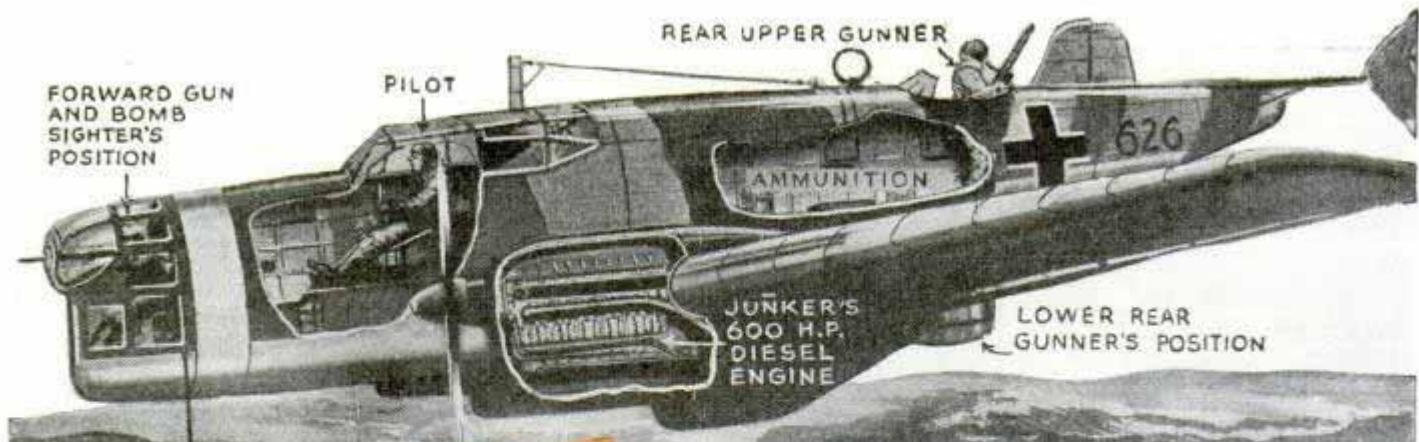
Left, top, powerful batteries of German cruiser in action. Center, the camera "stops" a torpedo as it is launched from a British warship; modern torpedoes travel a mile a minute and are deadlier in aim than those of world war days. Bottom, anti-aircraft gun on Siegfried Line fires over field



Twin-motored French heavy bomber, above, is a double-deck sky fortress carrying a pilot and two gunners on each level, an aerial camera mounted in the floor amidships and a rack of 1,100-pound bombs in a chamber between the wheels. These are released by levers thrown by bomber sighting through window in floor of nose (see opposite page). The gunners can fight off planes from any angle

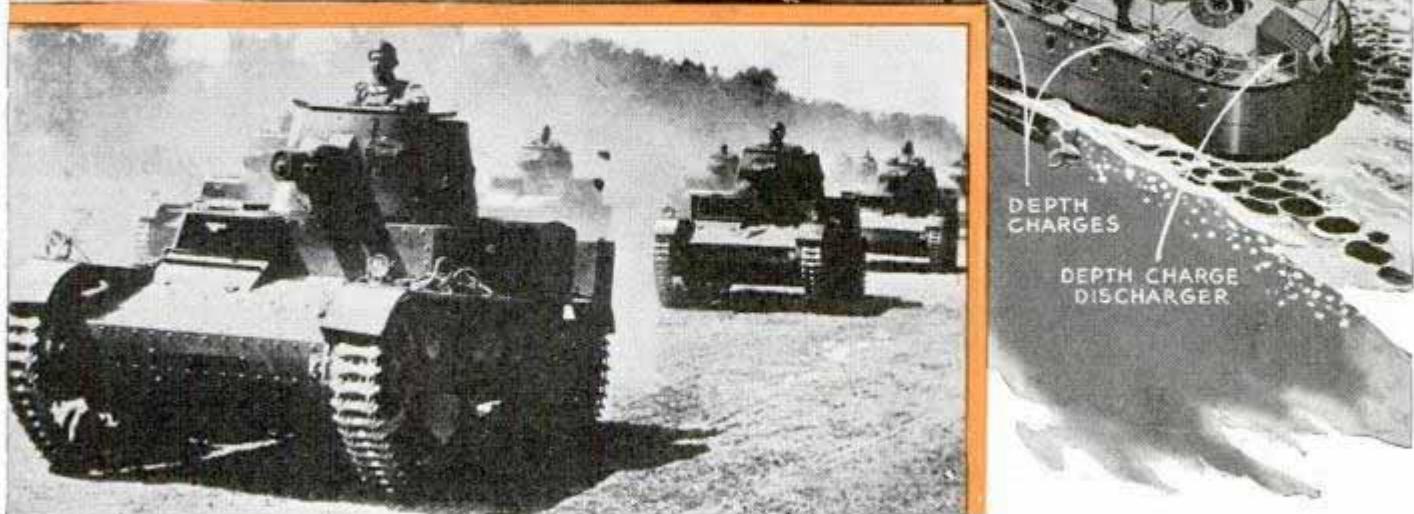
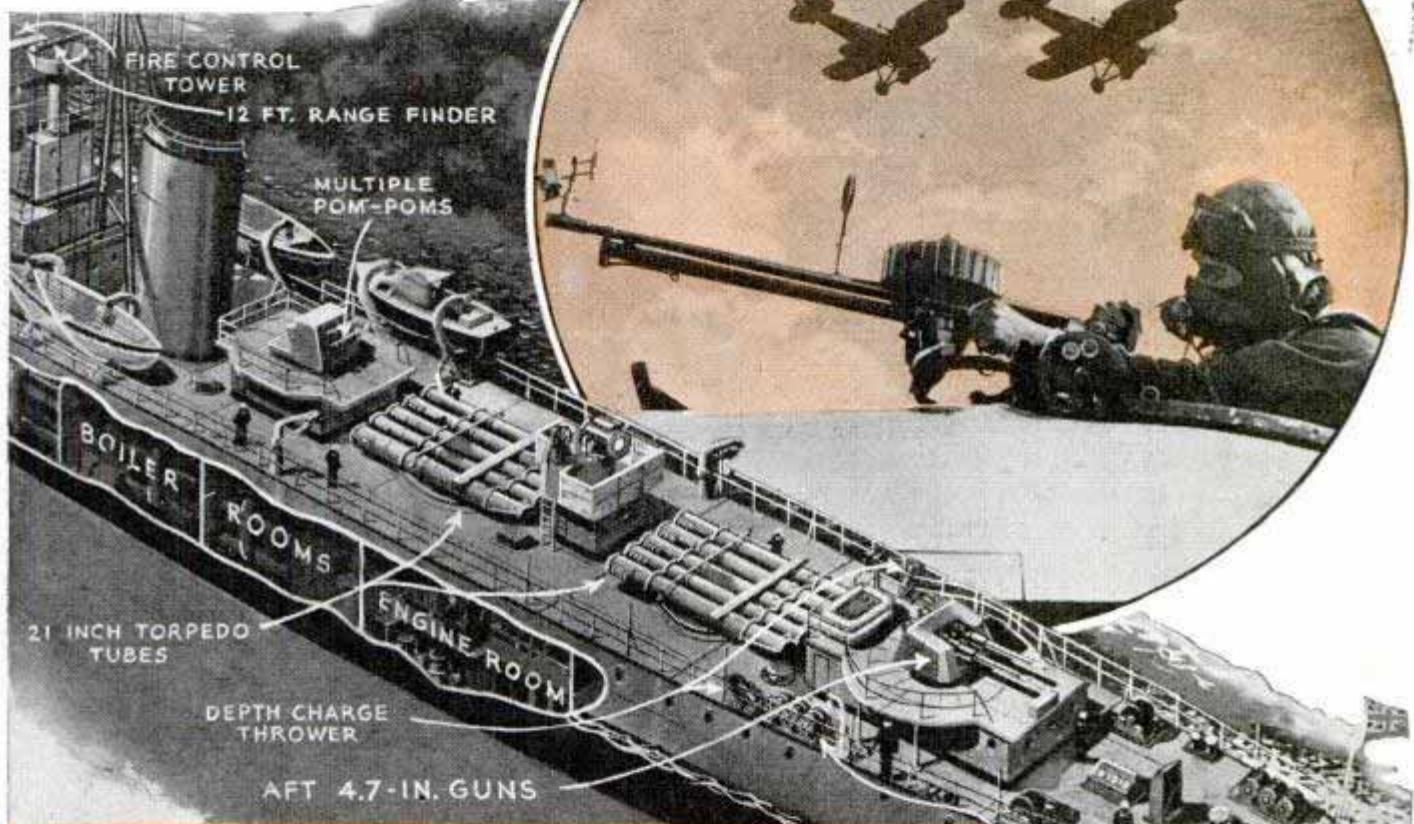
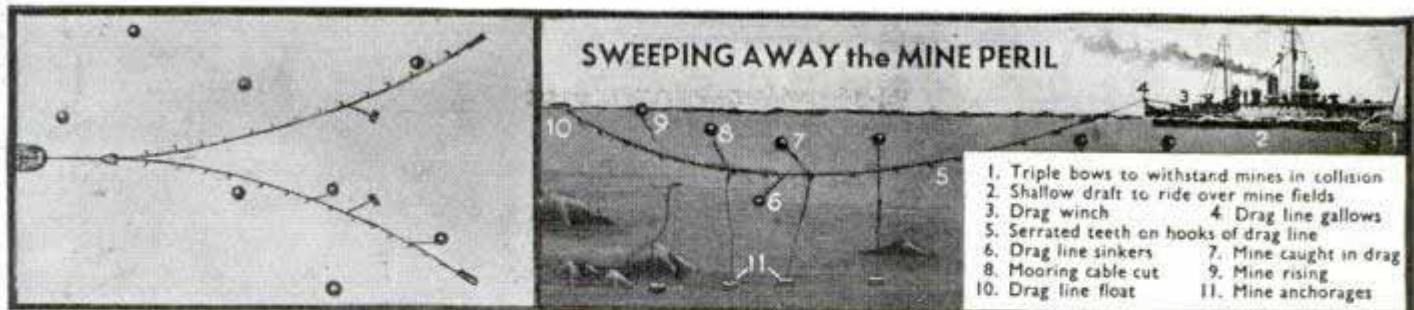


Above, infantry team ready to go into action with three-inch light mortar which fires forty shots a minute. Left, giant searchlight with which German troops in trench on "West Wall" spot enemy aircraft on night raids



Germans have pioneered with Diesel aircraft engines; heavy bomber above is powered by two 600-horsepower Diesels. It has an automatic pilot to relieve the human pilot for other duties, and a directional radio loop. Left, airplane detector at a listening post on Germany's western front

Cutaway drawing of the firing turret of a modern battleship's sixteen-inch gun battery, below, shows how powder and shells are hoisted on elevators from underwater magazines to automatic loading mechanism



Drawings at top show how a mine sweeper operates. In circle, war birds fly in formation above an aerial machine gunner. Center, a British destroyer, greyhound of the seas; 40,000-horsepower turbines drive it at forty miles an hour or better. For armament it carries ten 21-inch torpedo tubes and six 4.7-inch guns, depth charges and anti-aircraft pom-poms. Bottom, light tanks in mass advance

Pusher for Handling Barrel Saves Time and Effort

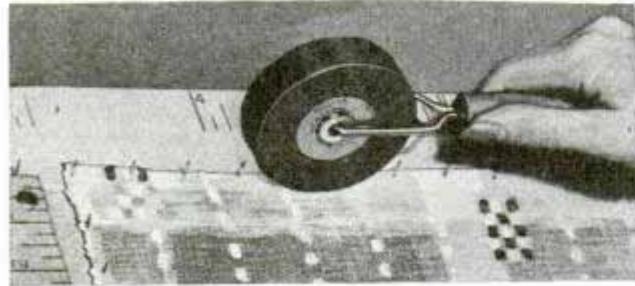


Barrel "goad" equipped with four rollers pushes and steers the heavy containers with minimum of effort

Filled barrels and drums can be handled easily by one man using a pusher now on the market. It consists of a wooden handle, at the end of which are arms equipped with four rollers, or casters, which revolve with the movement of the barrel. Thus, the barrel can be pushed along the floor or other surface with minimum effort. Since the rollers turn as the barrel rolls, it is easy to steer the barrel or drum to the position desired.

Roller for Stretching Curtains Helps Avoid Spiked Fingers

Painful injuries to fingers can be avoided when stretching curtains on the barbed-type frames if a rubber roller now on the market is used. This porous wheel takes

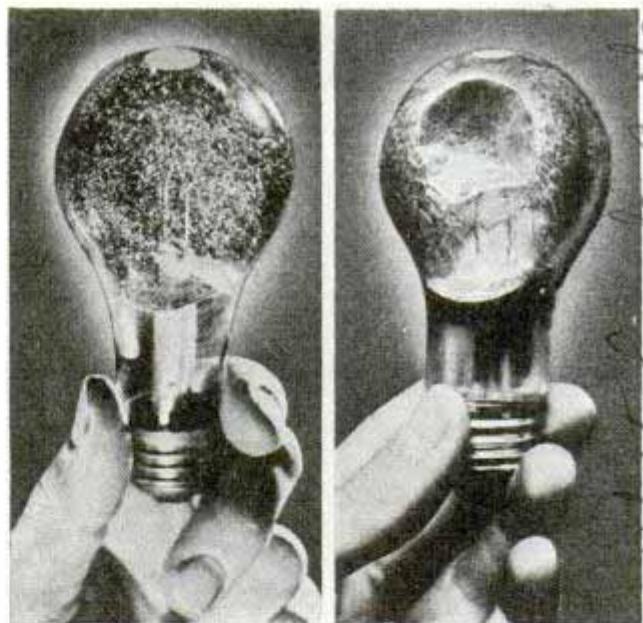


Rolling down edge of curtain over sharp pointed bars of stretcher with hand out of harm's way

over the hand's task of pressing the edge of the curtain over the sharp points, permitting the housewife to keep her hands away from the "danger zone." It is claimed that the soft rubber does not stick to the curtains and the tiny spikes can pierce it indefinitely without damaging the roller.

Shatterproof Photoflash Bulbs Wear Safety Jackets

Bursting and shattering of photoflash bulbs, a hazard to photographers, is prevented by the development of transparent "safety jackets" for the glass which make it shatterproof. Both the inside and outside of the glass bulb are coated with a heavy but invisible wall of film, forming a tough skin to keep the glass from flying apart. To demonstrate its toughness a bulb was dashed full force against a wall. Although the glass cracked and dented, it did



Left, unused bulb with shatterproof glass, and, at right, same bulb after being dashed against wall

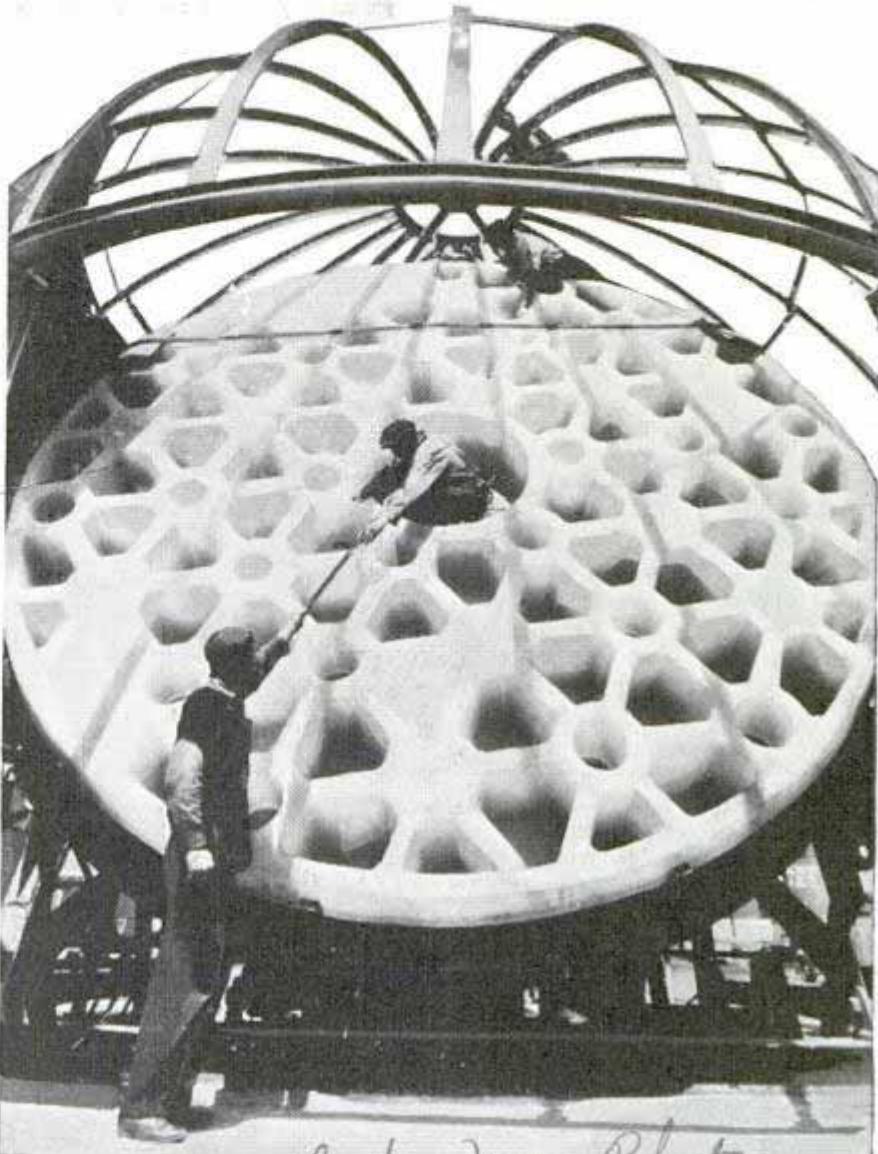
not shatter, and every bit remained sandwiched within the clear safety jacket. The bulbs have two other improvements—a blue spot which automatically turns pink if a defect develops before using, and the bulb cannot be flashed accidentally by contact with other bulbs or by outside electrical current or static.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

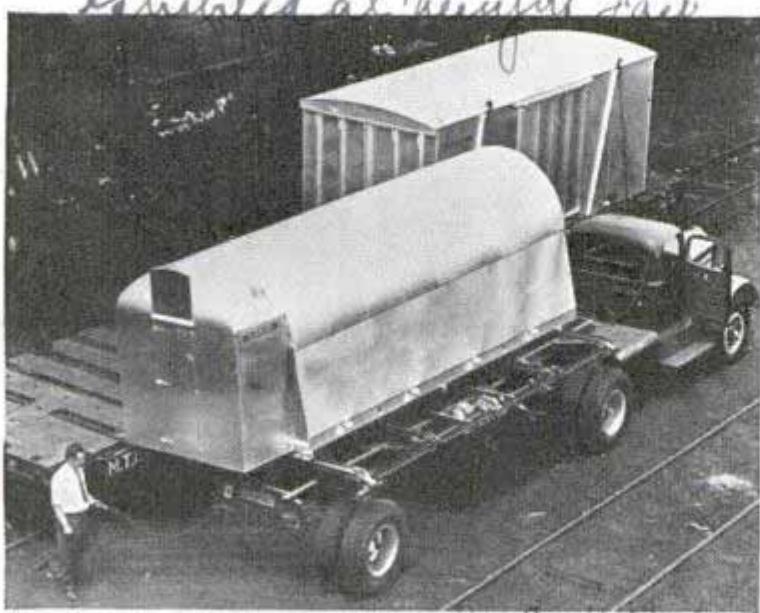
Giant Masterpiece in Glass Will Be Preserved

Described as the largest single piece of glass in the world, the experimental 200-inch telescope disk poured at Corning Glass Works as a preliminary to production of the giant mirror for Mt. Palomar, Calif., observatory will be preserved. It has just been placed in a steel-ribbed framework built in the form of an observatory at Corning, N. Y. Before the Mt. Palomar mirror was ground, it was the same size as the experimental disk.

Installing giant piece of glass in framework shaped like observatory. The glass will be preserved as reminder of work done on 200-inch mirror to be used at Mt. Palomar observatory



Push Button Shifts Huge Tank from Rail Car to Trailer



Laden with 4,000 gallons of milk, the big steel tank above is shifted from flatcar to highway trailer at touch of a button

To facilitate long-haul transportation by railroad and short-haul movement on the highways, a tank that can travel on flatcar or trailer has been developed. These steel containers can be built in any shape to accommodate the commodities to be carried. In the first public exhibition of this system a 4,000-gallon tank loaded with milk was transferred from a railway car to a highway trailer in ninety seconds, the interchange being operated by a push-button control.

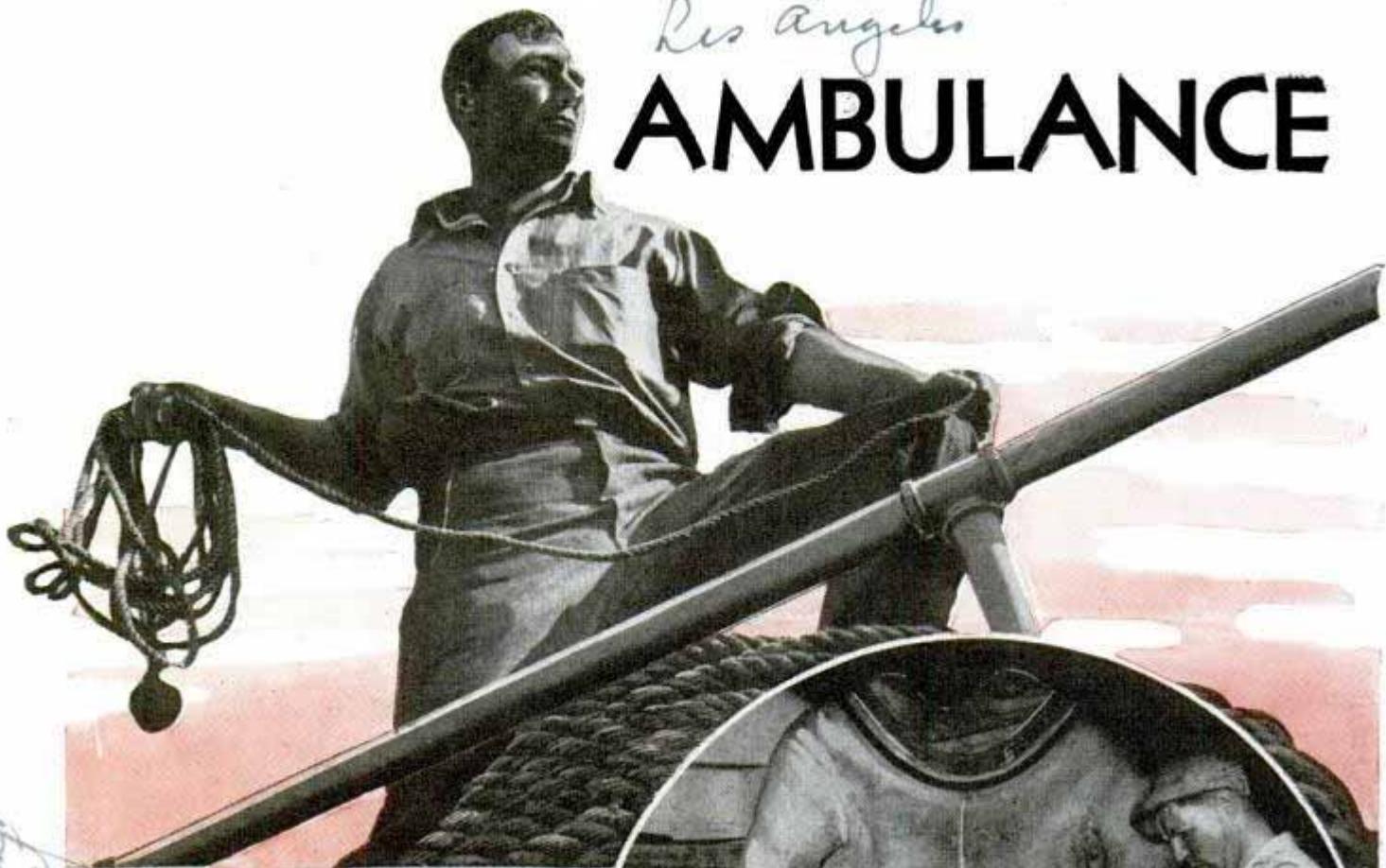
Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Developed by W. J. Pitch, President

20. 330

10555 Holman Ave
Los Angeles

AMBULANCE



Above, tossing a line from the "Retriever" to disabled vessel. Right, inspecting rubber diving suit for leaks; below, salvagers sinking pontoon alongside sunken hull

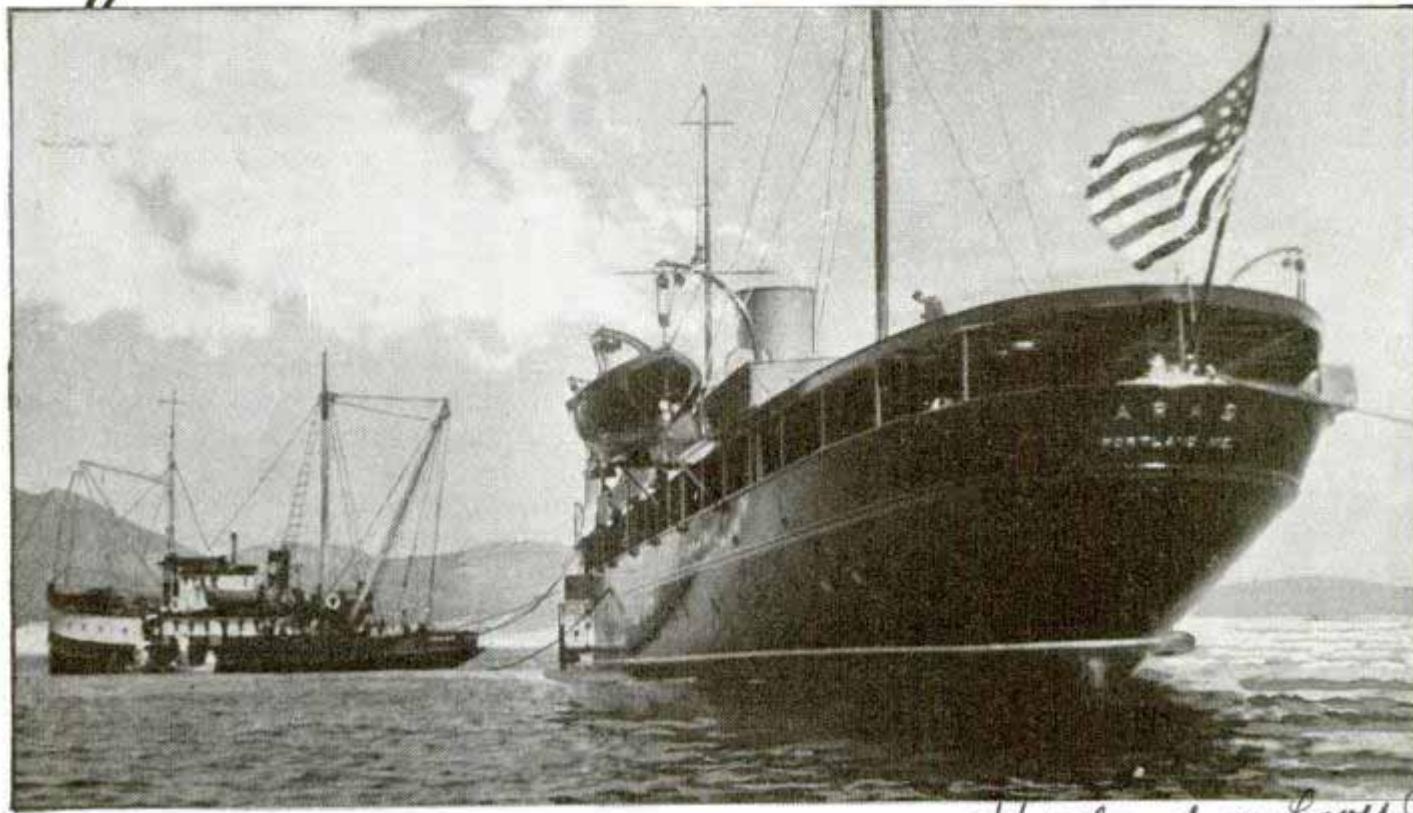
Plowman of the West Coast
PLOWING through the big seas of a storm, skirting close to dangerous reefs, or poking her nose into desolate bays, the salvage tug "Retriever" is a welcome sight when a ship piles up on the west coast.

She is apt to be found anywhere between Panama and California on her way to a rescue. Large ships rarely get into trouble and most often the "Retriever's" task is to salvage a big yacht or some husky tuna clipper that has gone ashore or is pounding on the rocks.

Recently the ship left Los Angeles for a fast run to the Galapagos Islands, 2,600 miles away. Repairs had to be made to the intermediate shaft of a tuna clipper. The job finished, the rescue boat was well on its return when new orders came in by radio. "Yacht 'Sans Peur' on the rocks off Espiritu Santo Island in the Gulf of California," came the message. "Needs your assistance." Captain E. D. Brown got in touch with the



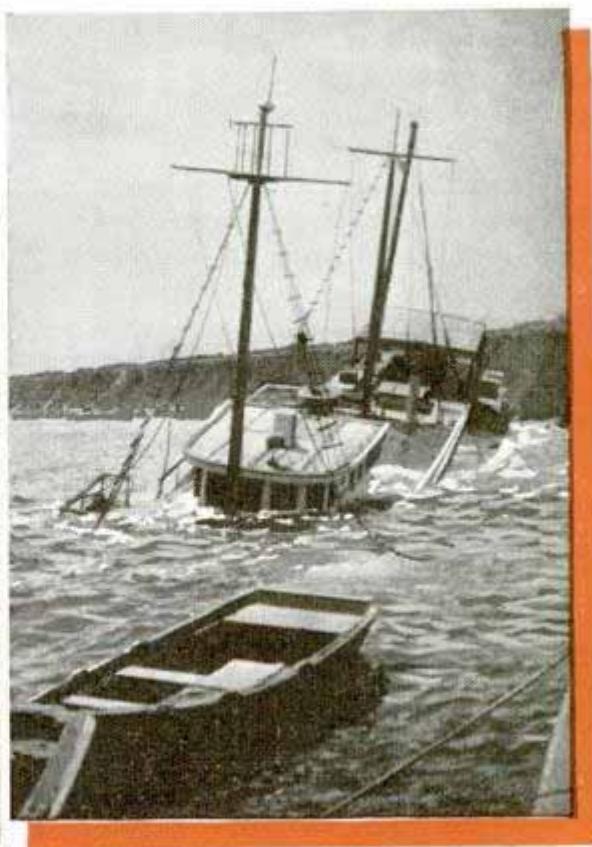
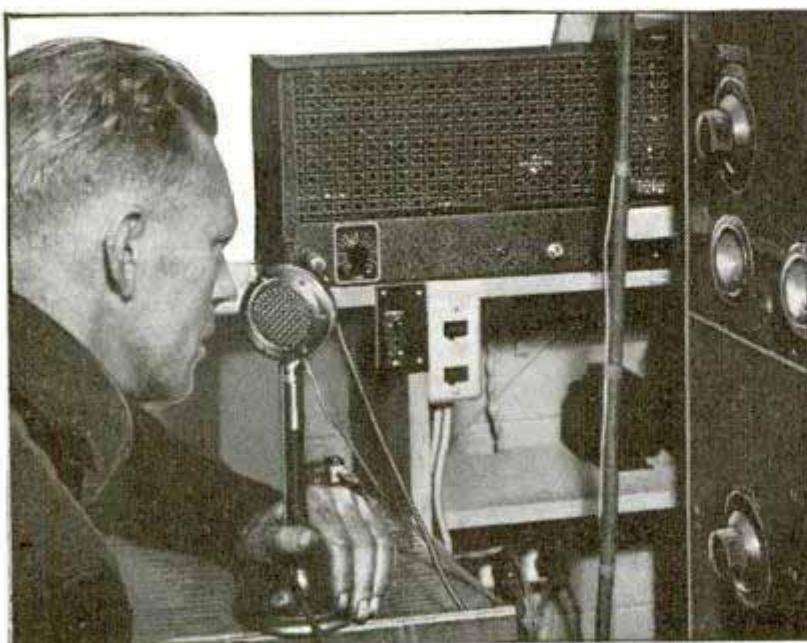
for CRIPPLED SHIPS

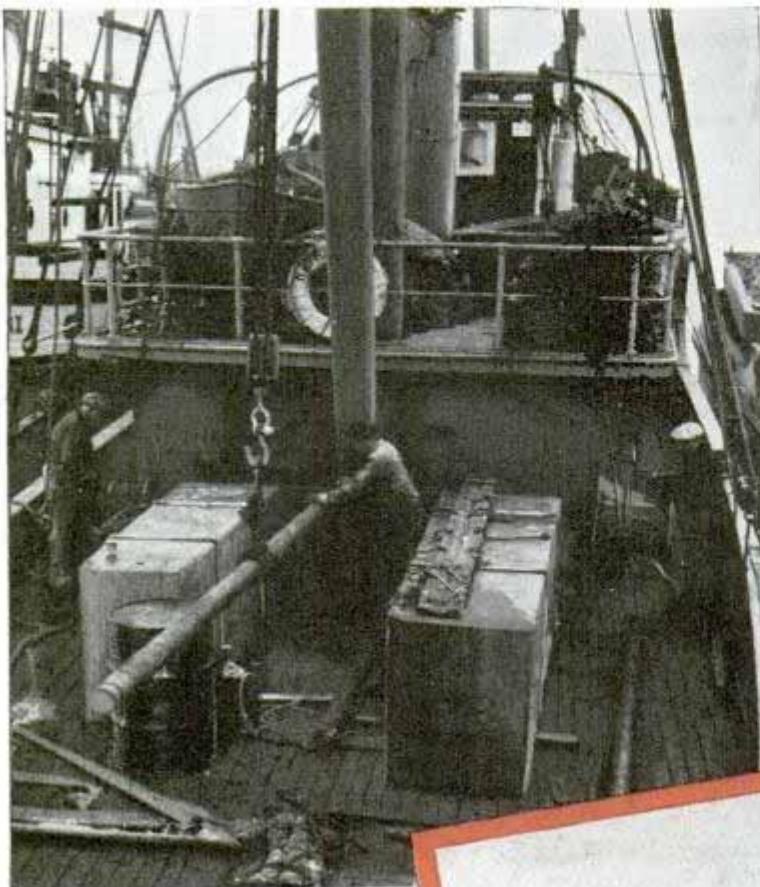


yacht by radio, then called Los Angeles back to order his diver, who wasn't on board, to meet him at a Mexican port.

The "Sans Peur" was a 200-foot steel English vessel and her captain had gotten her off the rocks and she was anchored, partly flooded, off a beach where she was safe unless heavy weather set in. The hull had opened up under water but Brown and his crew made her watertight again. The diver plugged the

off island on Lavae California
Top, "Retriever" moored alongside big steel
yacht which she has refloated after patching
hull. Bottom, long-range radio set used in
rescue work and a wrecked tuna clipper
being raised from bottom after divers have
mended holes in her side





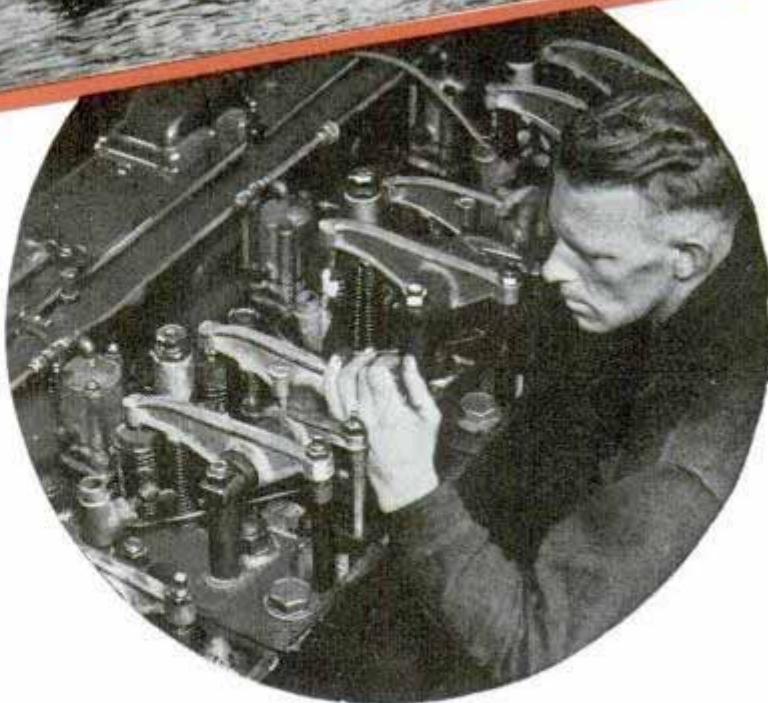
cracks with wooden wedges driven securely into the seams. The ship was pumped out and a big concrete poultice was applied inside to the damaged area. Then she was able to reach a shipyard under her own power.

The "Retriever" is an old ex-army tug, 100 feet long. Her original steam engine has been replaced with a 350-horsepower Diesel. On her way to a rescue job she may be loaded down with salvage gear until she looks like a floating junkshop. Pumps, diving gear, beach cables, towing hawsers, air compressors and pontoons clutter up her decks. In the machine shop down below the crew can manufacture nearly anything they may need, from a "pudding patch" of two by twelve timbers, canvas and oakum, to the steel bolts that a diver may have to fit into holes that he cuts in the side of a wreck to hold the patching material tight against the damaged hull.

When the ship is in port at Los Angeles and a first-aid call comes in it takes less than half an hour to rally the crew. Buck Scougale, first mate, lives close by. Diver Dan Boom and his tender, H. W. Stroele, are called by phone. Harold Keith, engineer and radio operator, usually is on board. Half a dozen experienced seamen complete the crew.

Salvage laws are not what they used to be and it is no longer true that an abandoned ship becomes the property of anyone who boards her. Almost always the title rests with the owners until they renounce it, after which ownership

(Continued to page 122A)



Deck of salvage ship, top, is crowded with every rescue gear useful in emergencies. Notice extra fuel tanks. Wrecked boat in center, with decks awash, was patched, pumped out and towed 1,000 miles to port. Below, valve assembly of Diesel engine

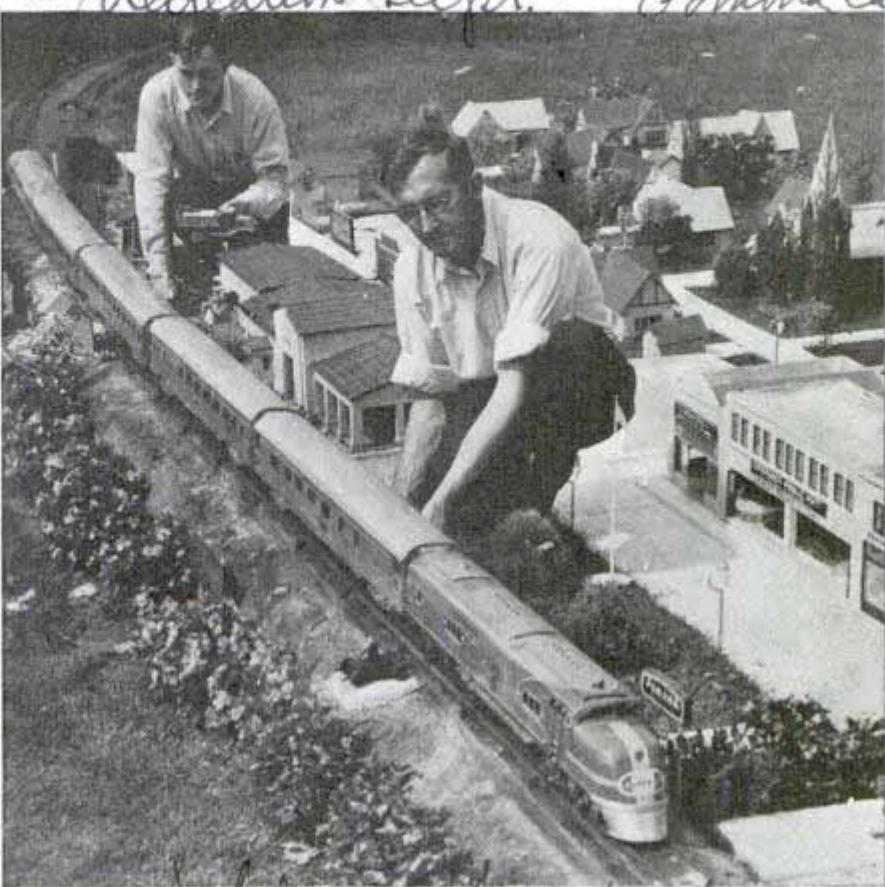
J 1056

Subt. Pomona City Schools
and D. Howard, Pomona
Recreation Dept. · Pomona Calif.

Model Railroad and Village Built Out of Doors

Built and operated out of doors, a model railway system with 220 yards of road has tiny ties laid on actual roadbed, following a scale of one-half inch to the foot. Automatic block signals and switches are of the most modern type, and the train is completely equipped inside. Copying one of the transcontinental trains, two model fans of Pomona, Calif., spent seven months at their hobby, making everything themselves even down to patterns and castings from which the smallest parts were fashioned. They chose as the setting a miniature town and included Indian pueblos and other scenic features that are so realistic as to deceive even the camera.

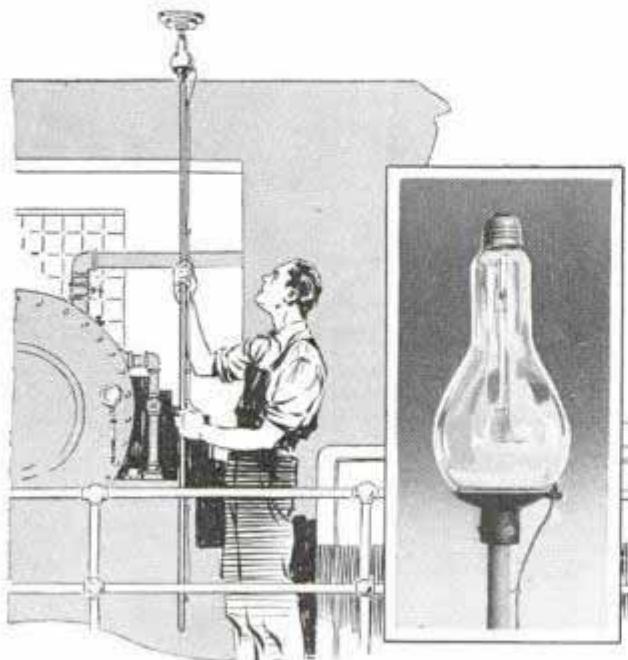
J 1052.



Sorbelman & Graduate
Model builders making adjustments in their miniature town complete with tiny streamliner operated by switches and running on 220 yards of track

Electric Bulb Changer on Long Pole Reaches High Ones

Electric-light bulbs in ceilings and other places out of reach without a ladder, can be changed in safety with a pole that has



Bulb changer easily reaches burned-out lights in ceiling. Inset shows suction-cup arrangement

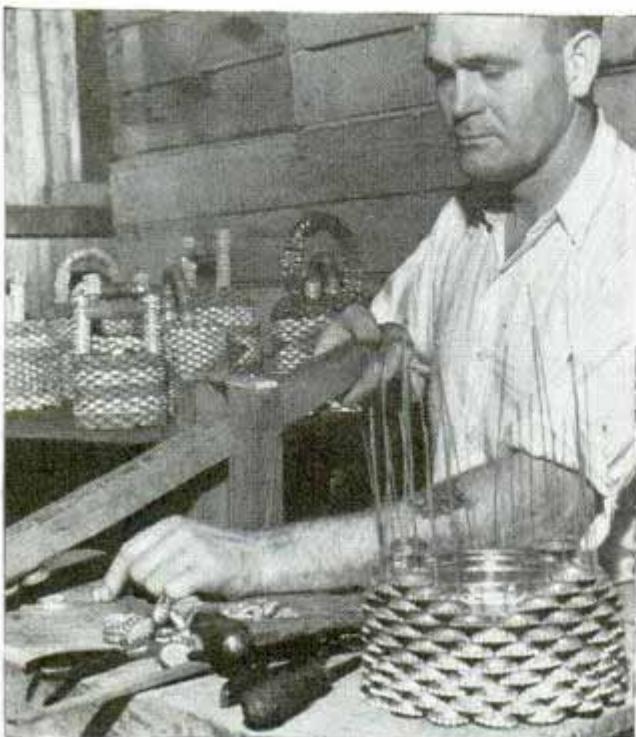
a suction cup at one end for gripping the lamp. One cup is designed to hold bulbs of many different sizes, and a string attached to its edge is pulled to release the lamp when secured in the socket.

J 1060.

Radio Helps Keep Bands Tuned by Broadcasting Musical Note

The musical note A above middle C is now kept on the air by the national bureau of standards in a continuous radio broadcast over station WWV with a frequency of five megacycles, so there is no longer any excuse for ill-tuned instruments. Interruptions occur only during short periods when the bureau uses the same frequency for other broadcasts, and every ten minutes the call letters of the station are given to insure identification. The accuracy of the pitch as transmitted—440 cycles per second—is better than one part in ten million, far beyond any musical requirement.

Making Bottle-Cap Baskets Is Profitable Hobby



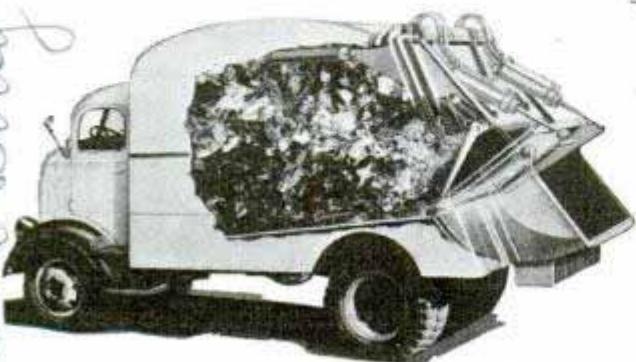
Assembling one of the baskets. In the background are other attractive products

Out of a hobby one Californian has developed a job that is fast becoming an industry. From such waste materials as bottle caps, empty coffee cans and discarded wire, he fashions attractive baskets that are in demand because of their practical value and unusual appearance. Between 500 and 600 bottle caps are required for each basket.

Self-Packaging Garbage Truck

Keeps Hopper Empty

All garbage and other refuse loaded into a self-packing truck is compressed into a compact mass many times heavier than the

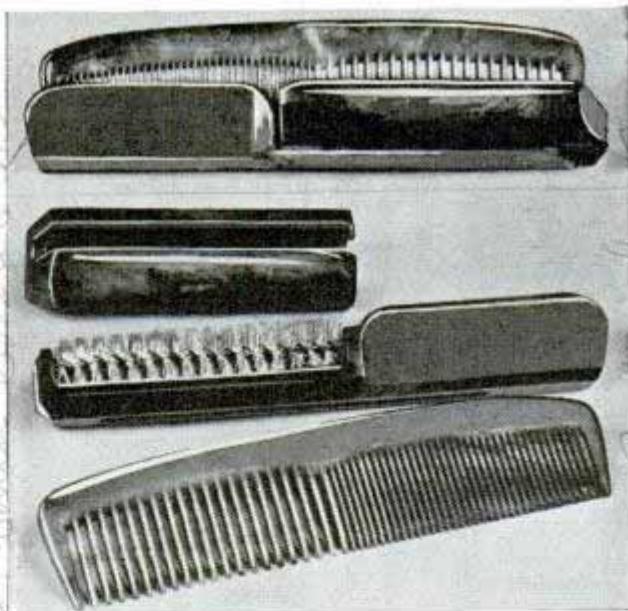


Hopper is emptied when garbage is rammed into truck body. Water drains into tank below hopper

usual loose load. To fill the hopper, a door in the tailgate ram is swung upward, and once in the hopper, trash is forced into the inclosed body by pressure of two hydraulic cylinders against the tailgate ram. An automatic retainer plate, which keeps garbage from falling back into the hopper when the tailgate recedes, snaps back against the tailgate ram when it moves forward. Taking only ten to fifteen seconds to complete, this operation insures an empty hopper after every filling. Liquids that are squeezed out drain into a tank below the hopper.

Pocket Comb and Brush in One Simplifies Scalp Treatment

Less motion is required in brushing and combing the hair with a combination of pocket comb and brush that forms its own carrying case. It is handy for men as well as women and children in massaging the scalp, and cleaning, brushing, combing and setting the hair. In use, the comb is lodged



Three parts of brush and comb assembly. Top, they all fit snugly together for carrying in pocket

between two small rotary brushes with its teeth projecting slightly so they pass through the hair as it is brushed, performing the dual service of combing and brushing at one time. For carrying, the comb is inserted in the brush, teeth first.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

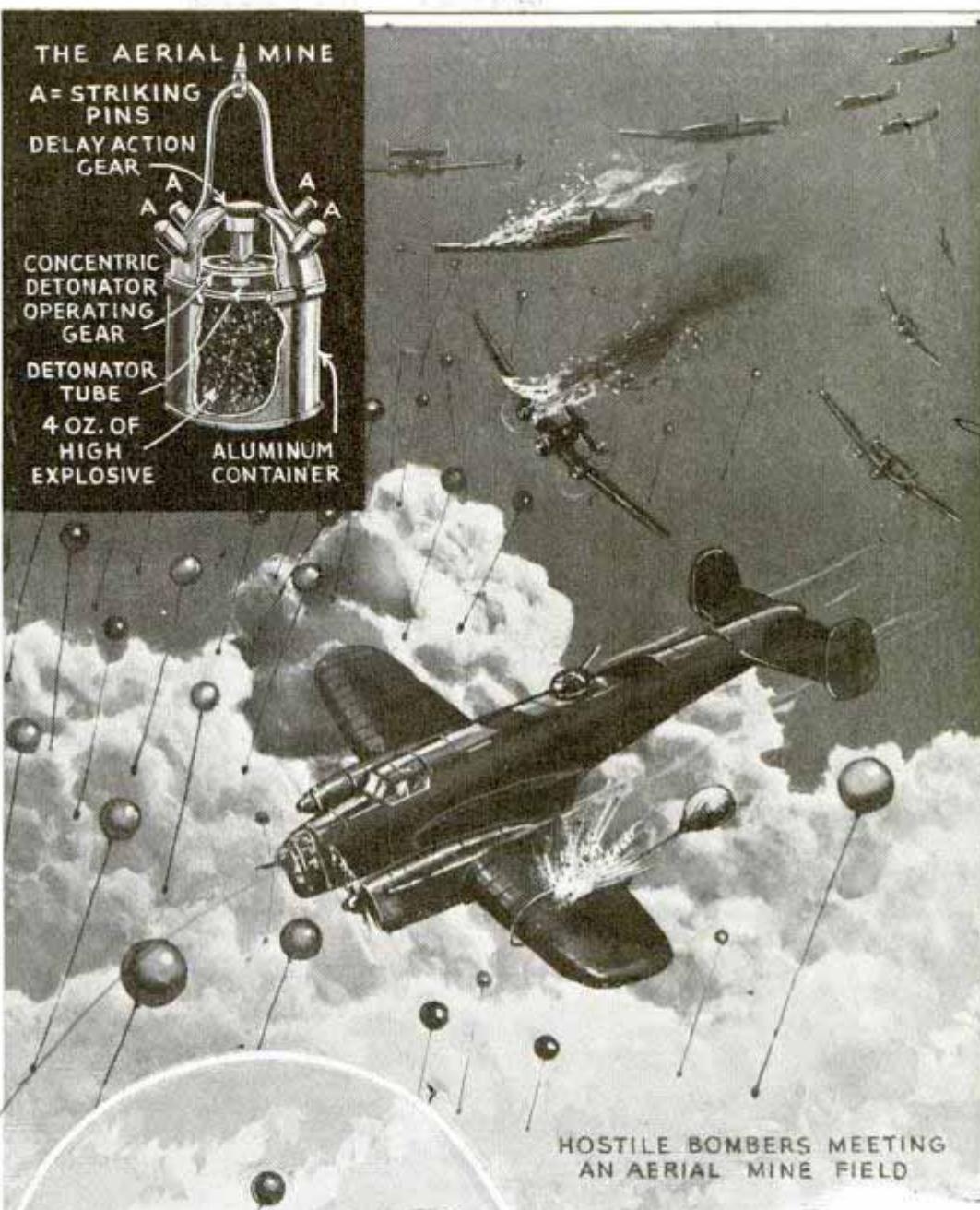
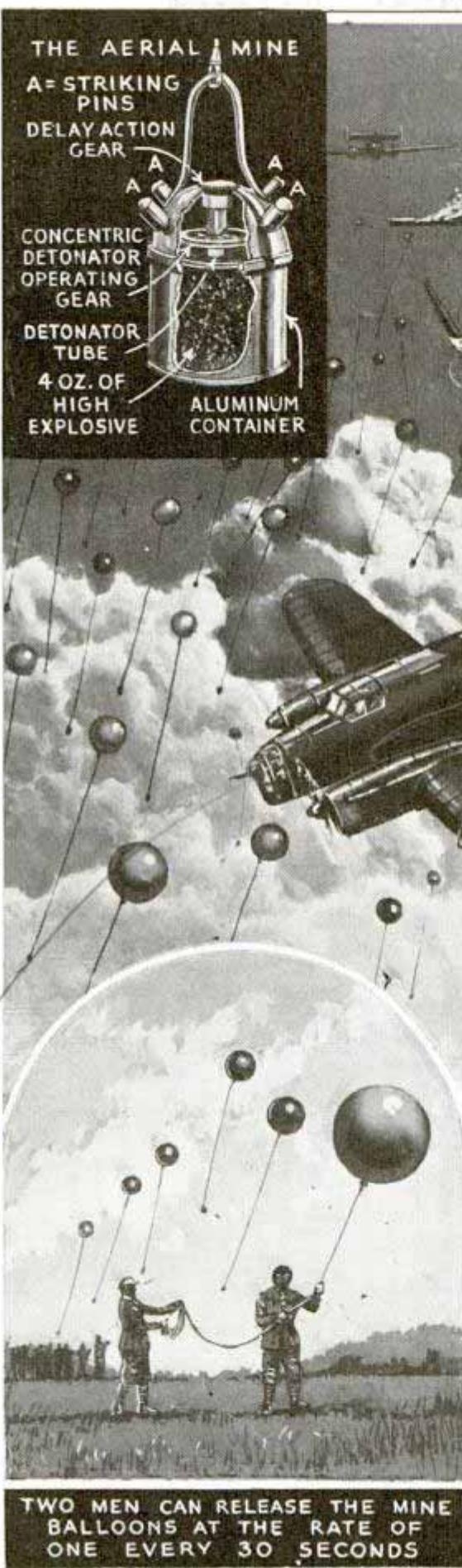
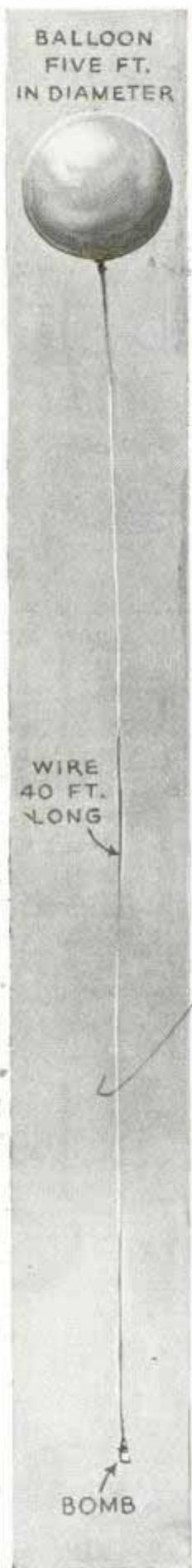
2953

1st May. H. J. Muir,

POPULAR MECHANICS

England. 855

Aerial Mine Field Guards Against Plane Raids



Here's how the aerial mine field, invented for protection of England against enemy air raiders, is intended to be used. Hundreds of hydrogen-filled balloons, each five feet in diameter, are sent aloft, perhaps to 30,000 feet, with small bombs suspended by long wires. Aircraft striking one bomb would be damaged severely, perhaps disabled. It is claimed the balloons can be regulated to float at the altitude desired. Cost of the aerial mine is said to be small, thus permitting its use in large numbers for the protection of cities and military objectives.

Cont. on p. 14
Slaves: Dimmey: Hellside
Road, Ewell, Surrey, England.

Mixing Speed Is 'Tuned In' by Dialing Name of Food



Cheese *Close-up of dial, in inset, shows how names of food are lettered opposite numbered speeds to guide cook*

Whatever the food to be mixed, the housewife simply "tunes in" to the correct speed by dialing its name printed on the automatic selector of an electric mixer now on the market. Whether the task is creaming the butter and sugar for a cake, blending salad dressing or whipping potatoes, the proper mixer speed for it is plainly indicated on the dial.

Paint Resistant to Decay Has a Charcoal Base

Kar. Com. Seal Objects of ancient civilizations, which have passed down to us in a good state of preservation, indicate that charring is one of the oldest forms of preserving wood known to man. With a formula recently developed it is possible to char many building materials, including metals, concrete, brick, plaster, roofing, canvas, paper and all types of wood. The base of the product, which has about the same consistency and covering qualities as paint, is

*to Albert Stoffel,
300 West Solomont
Ama Day*

charcoal obtained by burning hardwood to 800 degrees Fahrenheit. It is black and can be applied easily with a brush or a sprayer, and when applied it forms a hard, permanently bonded, non-porous, flat black coating of carbon resistant to moisture, fungi, salt, termites and acids.

2983

Newspaper Is Made Fireproof by Liquid Compound

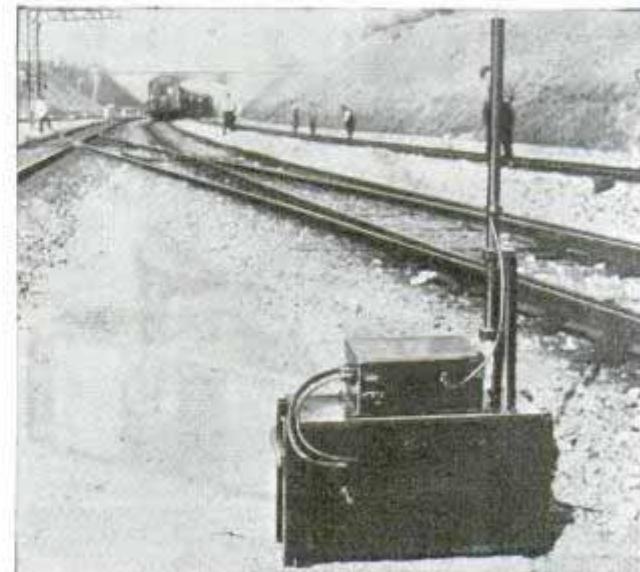
Anti-flame Any inflammable material such as wood, newspapers, silk cloth and straw hats can be made fireproof, it is claimed, by treatment with an odorless, colorless and tasteless fluid

invented by an Italian chemist. His compound has a mineral base dissolved in water, and when approached by flames the treated material gives off a gas which forms a protective layer between the substance and the fire. Besides being given a fireproof "life" of eight to ten years, substances so treated are made thirty per cent more resistant to ordinary wear and tear, the inventor says.

91028

Portable Grade-Crossing Signal Is Operated by Wireless

Useful for emergency or temporary installations, a portable railroad-crossing signal operated by radio may be moved to



Wireless warning signal can be moved along track

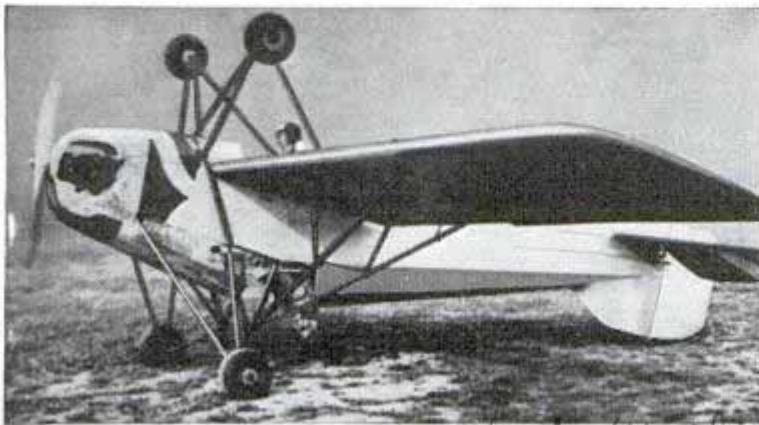
Carp., Hamilton

any section of the track to protect workers as well as pedestrians and motorists. At one end is a transmitter radiating a constant signal on a five-meter wavelength. A radio receiver at the other end operates a relay which is normally held closed by the regular signal. As soon as reception is interrupted, the relay opens and sounds a loud horn to warn that a train is approaching. Each set is carried in a small case mounted on top of a larger one containing a six-volt battery. They are shifted along the track as a section gang progresses.

J 10 23
**Hydraulic-Drive Diesel Engine
Hauls Heavy Loads Smoothly**

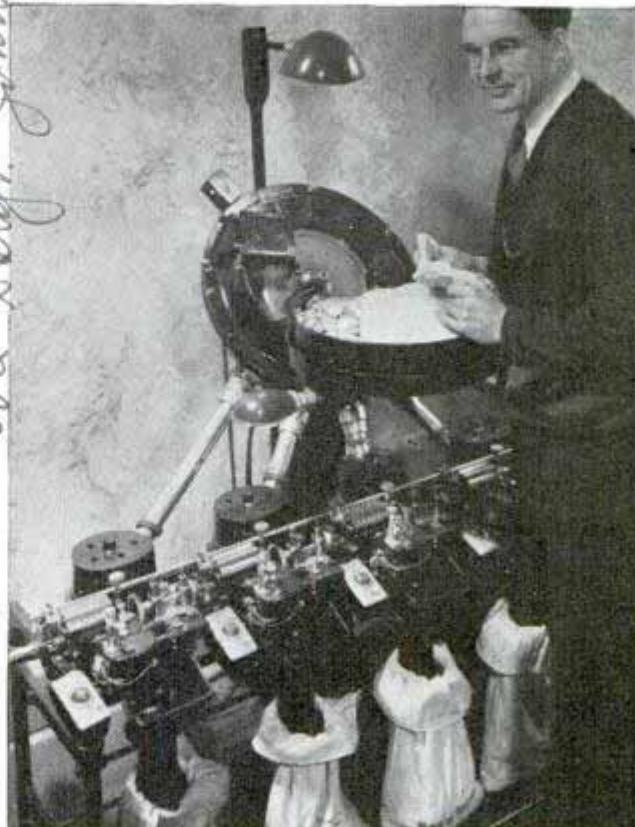
Three loaded coal cars were pushed up a five-per-cent grade from a standing start, halted midway of the climb and then resumed the ascent in a demonstration recently of the smooth power of a Diesel switching engine equipped with a hydraulic torque converter. As many as 107 empty cars were handled with ease on a three-per-cent grade by the six-cylinder Diesel locomotive. The new hydraulic transmission consists of an American designed hydraulic torque converter and hydraulically engaged and disengaged gear sets, the shifting being accomplished by a lever at the operator's control stand. The converter, with only two moving parts, runs in an oil bath with sufficient clearance between the rotating parts to avoid wear, and since there is no mechanical connection between engine and transmission, the power delivery is smooth and devoid of road shocks.

J 10 11
Upside-Down Stunting Airplane Lands Safely on Its Back



Stunt plane with twin pilots and twin sets of landing wheels can turn turtle in air and make three-point landing on back

John French
**Coin Counter and Sorter
Never Makes Mistakes**



Coins poured into hopper are sorted and then counted as they clink along into the right money sack

Millions of coins are counted each year by a complex machine that never makes an error. The money-counter handles all the tolls paid on the San Francisco-Oakland Bay bridge. More than \$5,000,000 a year paid by motorists clinks through the machine which shakes it in the hopper, sorting the coins into sacks and recording the total of each denomination.

You really see double when you look at a topsy-turvy plane designed for stunt flying. Besides the conventional landing gear and cockpit, the ship has an extra set of landing wheels on its back and a cockpit where a second pilot "sits" head downward. The plane can turn over in the air and land on its back.

John French
A Philadelphia violin maker has made a bow of 150 stainless-steel "hairs" 1/2,000 inch in diameter.

*clms. { Michael Murphy
John French*

Mask Made of Rubber Bulb and Football Bladder



Andy Arnold Photo
Pilot wearing his homemade oxygen mask made of rubber bulb and football bladder

By joining together a football bladder and a rubber bulb, with a valve between them, Art Bussy, racing pilot, designed a homemade oxygen mask which he used in the 1939 Bendix air race. The bulb, of the type used with battery hydrometers, was formed to fit over his mouth and nose, and the valve permits escape of exhaled air. Oxygen under pressure is fed gradually into the bladder and from there it is inhaled with ease.

Expanders Seal Piston Rings at Wall, Groove and Gap



An unbroken oil seal in the cylinder is claimed for a multi-piece piston ring. Seven expanders force it against the wall, and also spread the ring in the

groove to insure a snug fit. Another expander, wedge-shaped, pushes against the gap in the ring to keep it closed at that point so oil will not seep through, at the same time preventing rotation of the ring. Inside each expander is a coil spring that takes up normal wear automatically.

J 10/2

Camera Snaps Deep-Sea Scenes at Depth of Two Miles

Photographs two miles down in the ocean have been snapped with a massive, automatic deep-sea camera and lighting arrangement invented by Prof. E. Newton Harvey of Princeton University. The submarine device has two windows of extra strong glass to resist the two-ton per square-inch pressure encountered at that depth. The camera looks through one window and a beam of light is projected through the other. A timer operates the electric lamp and camera at predetermined intervals, and a motor winds the film.

J 10/25

Model Plane Kept on Even Keel by Pendulum Hung Beneath

Annoyed by frequent "crackups" that all but wrecked his tiny plane, a model builder designed an "anti-dive" pendulum that keeps the frail craft on even keel in the air and brings it down invariably to a



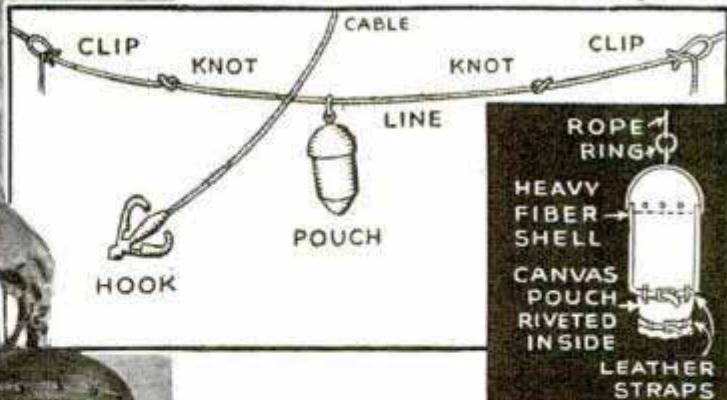
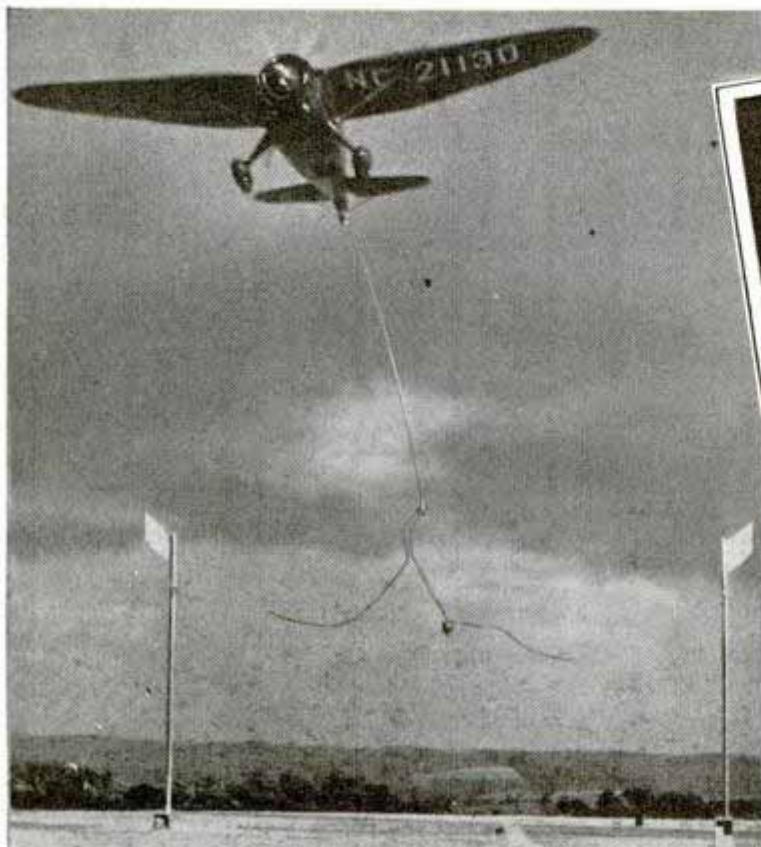
Andy Arnold
Arrow points to pendulum which swings under model plane, automatically keeping it on even keel

perfect landing. The pendulum is suspended in a ball socket under the fuselage. If the plane goes into a dive, the pendulum swings forward and pulls on control lines leading to the elevators, thereby righting the ship. Cross controls similarly prevent too steep a bank or turn.

*Work - Out Products of Mr. Ed Carsten's
148 - 11th St. Toledo, Ohio Warrensburg, N.Y.*

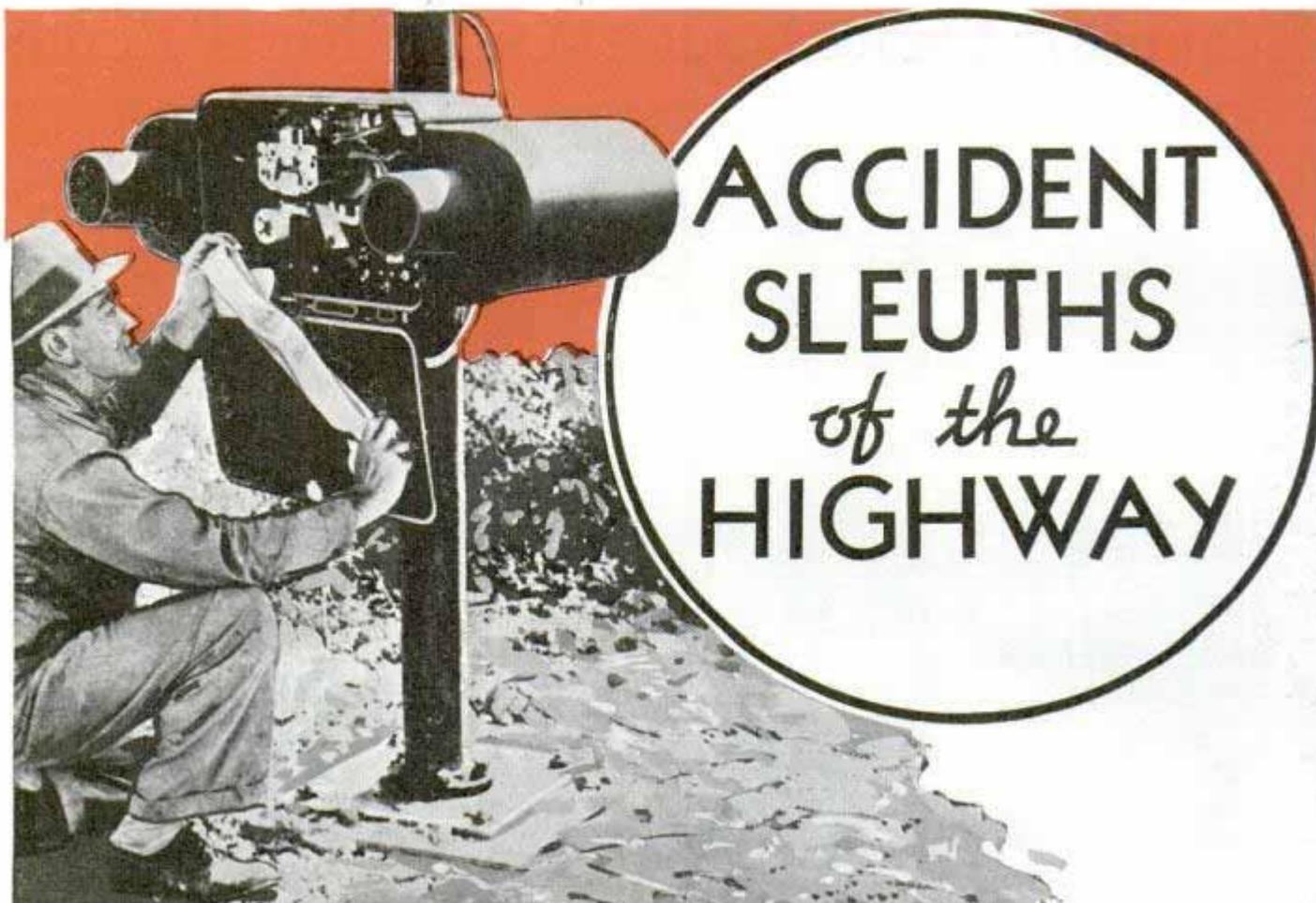
2993. Mr. Alexander Maxwell,
720 Sherman Ave

Nonstop Plane Handles Mail on 'Rural' Route

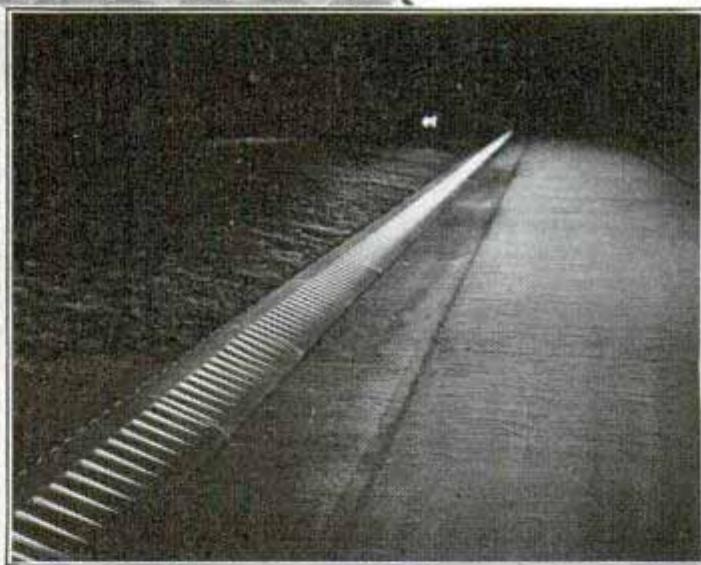


Communities inaccessible by rail or located in rugged country are being served by nonstop planes that pick up and deliver mail. At each point on the modern "rural" route, the plane drops a pouch and picks up another suspended on a line between two tall poles. A grappling iron let down by the pilot engages the line so the mail bag may be hauled into the plane. Top, left, dropping pouch and picking up another. Right, the grappling iron. Center, sketch of pickup system. Bottom, left, mail clerk emptying pouch to take letters by auto to the post office

2949



ACCIDENT SLEUTHS *of the* HIGHWAY



Top, automatic recorder registers flow of traffic on tape. Below at left, narrowed center island allows extra lane for left-turn traffic; right, reflector fins outline curb at night

THEY'RE fighting highway accidents today with pencil and paper and cameras—and getting results. Preventive medicine for traffic tragedies rides in the same patrol car with first aid for the victims of the latest collision.

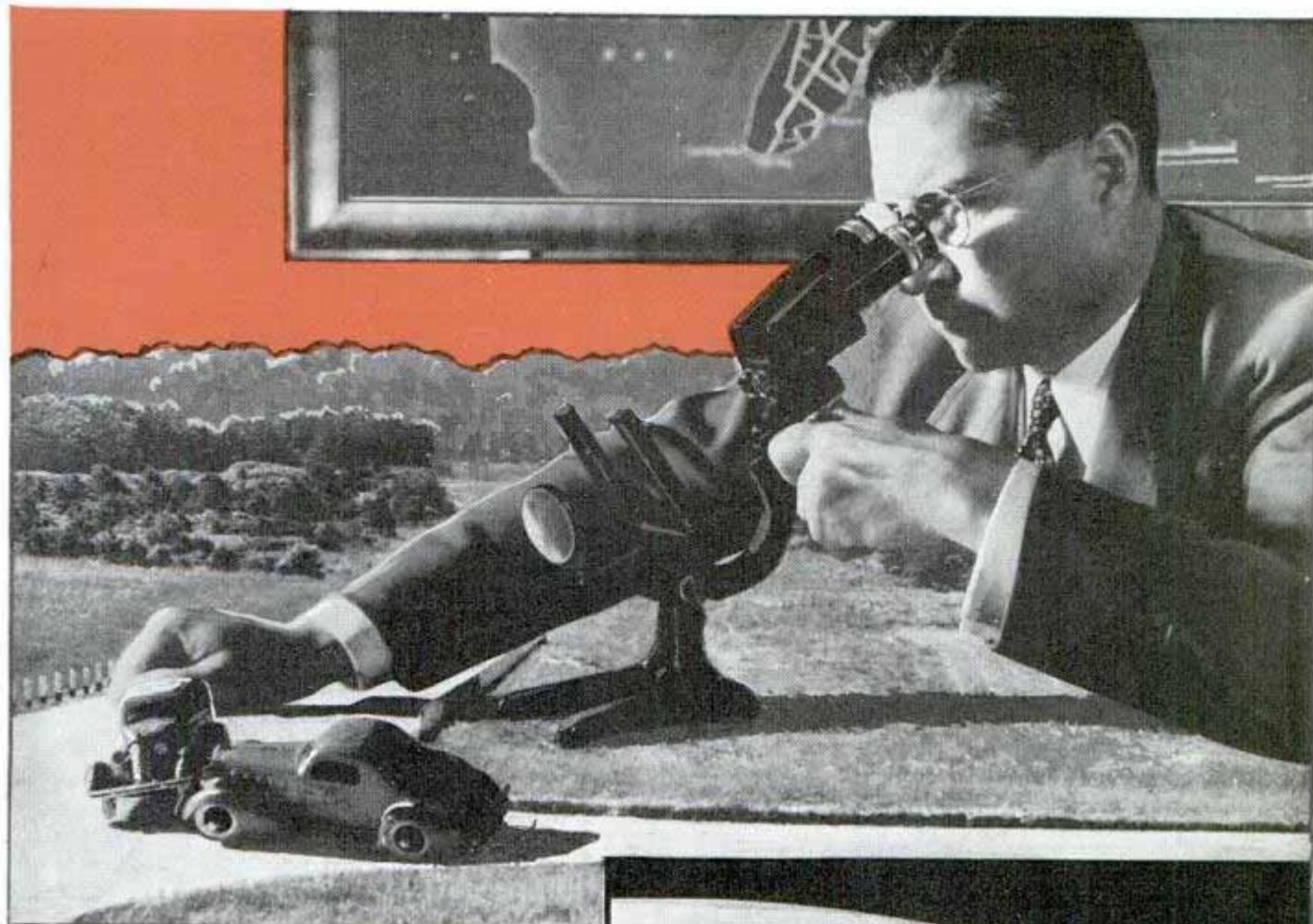
No sooner does word of an accident reach the police radio dispatcher than he's at the microphone directing the nearest

By James McQueeny

Kansas City, Mo.
431 W. 60th Street

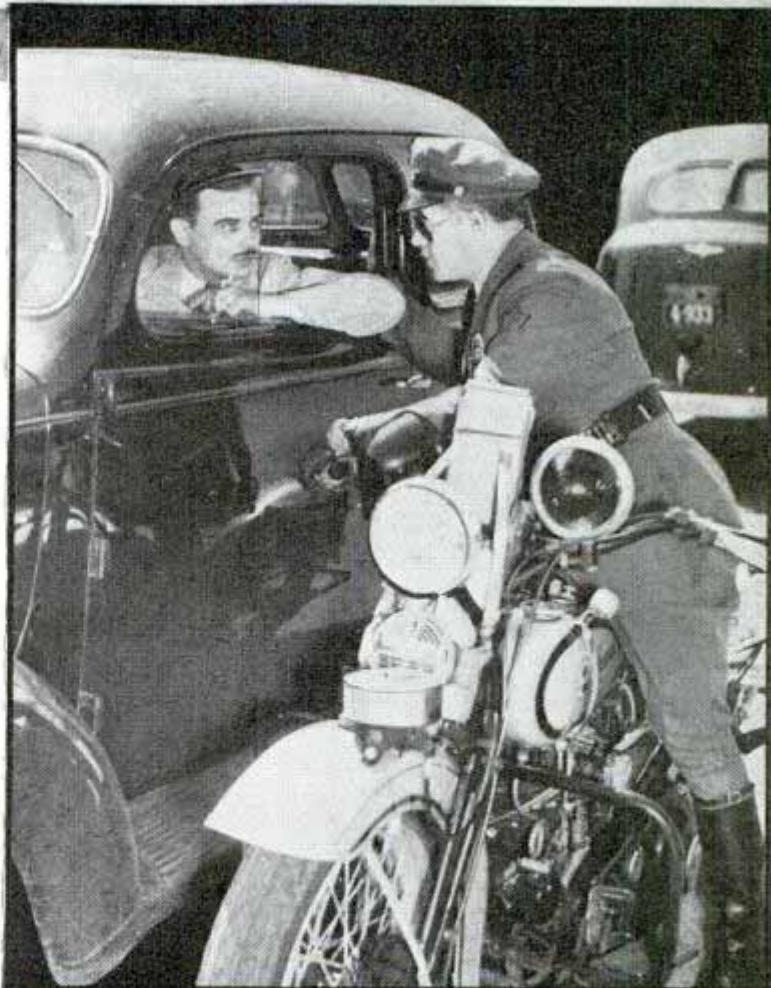
squad car to the scene. Then he gives the order: "Accident Investigation Car No. 3 proceed to Sixth and Main—motor car crash."

Upon their arrival, the investigators, trained in first-aid methods, treat the injured. Then out come cameras and report sheets to translate the accident onto film and paper. Their scientific report is the backbone of the new science of saving lives

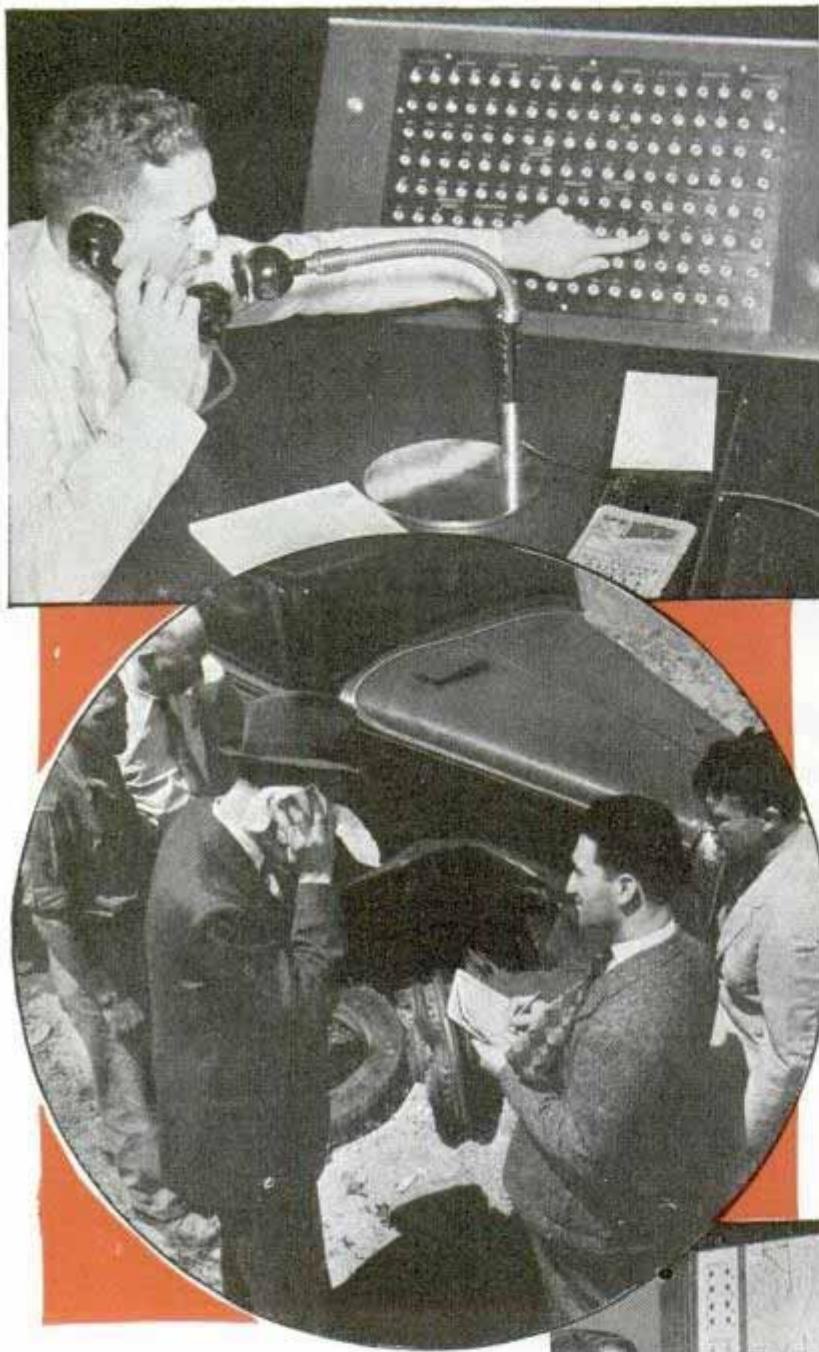


in the streets and highways. Until a year or so ago, an air of hopelessness hung over the motor-death problem. Statisticians calculated that one child in three was born to be killed or seriously injured by a motor car. But last year the motor-death graph, instead of continuing its upward trend of the last two decades, shot downward. Fatalities dropped from 39,643 to 32,000; the appalling injury toll and financial loss from accidents showed corresponding decreases. A few cities and states, not the entire country, were responsible for the change. In virtually every instance, the scientific accident report figured prominently.

No better example of its worth can be cited than in New Jersey. On the far-flung federal system of highways, the average daily volume is 1,700 to 1,800 motor vehicles, yet in New Jersey, over Route 25, from the Holland Tunnel, via the Newark airport through Eliz-



Traffic commissioner puts reenacted highway accident under microscope, top. Below, warning at danger spots is a preventive



abeth and the Woodbridge Clover Leaf, an average of 60,000 vehicles travel every day. Last summer, a record flow of 102,000 cars passed a check point between Newark airport and Elizabeth during a twenty-four-hour period.

Owing to this congestion, an average of four persons were killed and twenty-four sent to hospitals every day in 1937. It would have taken many millions to make New Jersey's highways accident-proof. Only limited funds were available, however, so E. Donald Sterner, highway commissioner, set about to provide

the maximum safety for a minimum of expenditure. His first step was to select four typical stretches of roadway ranging from three and three-tenths to twelve miles in length as "accident laboratories." Twenty-four-hour accident patrols were launched, three men alternating every eight hours, riding back and forth continuously, over five-mile stretches; traffic counters were stationed at strategic locations to record traffic volumes and establish ratios of accident rate and traffic flow. Cruising back and forth along the sections assigned to them, the investigators are prepared to swing into action at the crunch of a fender. Their reports are a study in completeness; the time of the accident, condition of cars and drivers, weather, road conditions—all data pertinent to analysis of the cause of the crash. The report is submitted to safety engineers who analyze the contributing factors and classify the crash under one of several types.

(Continued to page 121A)

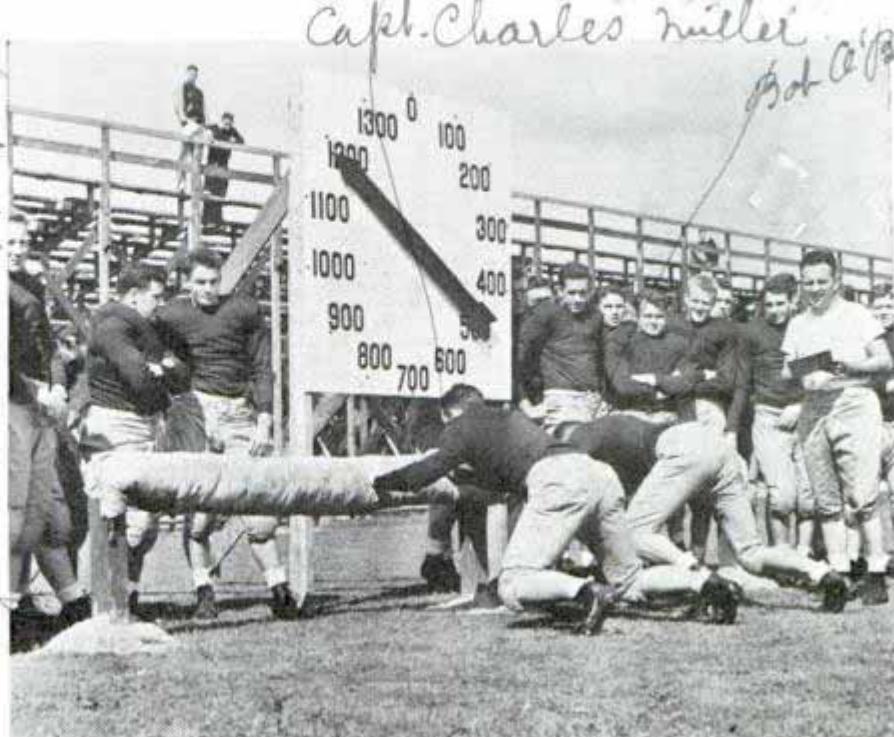


When accident investigation car is on emergency call, operator darkens its light on board, top. Center, interviewing driver after crash. Below, patrol cars spotted on Kansas City map

Mayord
**Half Brain as Good
as Whole One
Surgery Finds**

Wardrobe Case and 1684
Chesney Newell 9/10/34
 Removal of brain tumors by surgery has brought out the paradox that half a brain is as good as a whole one and much better than three-quarters. Actual improvements in personality have been noted in persons after removal of one of the two frontal lobes in the forebrain, seat of human intelligence, according to a report of Prof. Byron Stookey, brain surgeon of the Neurological Institute of New York City. Such persons were found to make quicker decisions than when the whole brain was functioning. However, when one of the two frontal lobes was only partly removed the operation was followed by emotional instability, listlessness and indifference.

*Players Test Their Strength
with Football Power Meter*



Football players bucking against power meter to test their blocking strength. Pointer on numbered dial indicates amount of force used

Leavenworth 9/10/29
 Football players of the Dartmouth team demonstrate their strength by pushing against a "power meter" that registers the amount of force applied. The coach thus can test the power of his men either individually or in groups to obtain information that may be of value in preparing the lineup.

Polarizing Filter on Lens Pivot Is Sighted over Camera



Photographer looks through polarizing filter to adjust it, then swings it in front of camera lens

E. Leitz dne.
 Accurate adjustment of a polarizing filter for cameras is possible with a pivot mounting attached to the lens. The polarizing screen is free to turn in a collar, which is pivoted on a clamping ring that, in turn, fits over the camera lens. This assembly permits the screen to be pivoted from its position in front of the lens to a point above the camera, where the photographer may look through it and turn the screen until the desired angle is obtained. Then when the polarizing screen again is swung in front of the lens its angle is the same.

Levitt
 Our Bureau of Information keeps on file the names and addresses of makers of, and dealers in, all devices described in the pages of Popular Mechanics Magazine. We are glad to furnish this information to our readers upon request, accompanied by stamped, self-addressed envelope.

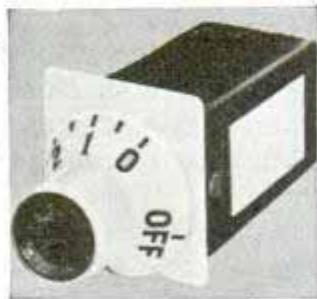
Windshield for Bike Rider Gives Dust Protection



Bicycle rider is protected from wind, rain and dust by windshield mounted on handlebars

Protection against wind, dust and rain is provided by a neat windshield that fits on the front of the bicycle. In addition to reducing wind resistance with its curved surface, it saves the rider's clothing from dust and dirt tossed back by vehicles ahead.

Automatic "On-and-Off" Switch Controls Electric Burner



Variable heat control for electric hot plates and top-of-stove burners is afforded by a switch that turns the current off and on intermittently. Matching the flexibility of a gas-stove burner, the switch can be regulated to supply any amount of heat from a low simmering point to the burner's

no 11 Sagamore man

highest capacity. It is not intended for ovens since it does not regulate the exact temperature, but merely varies the power input by opening and closing the electric circuit for specific time intervals. The longer the "off" and the shorter the "on" periods, the lower the input will be, and consequently the less intense will be the heat. Any degree of heat desired for cooking is selected by turning a knob.

1094

Fabrics Made Water-Repellent by Chemical Finish

Clothing can be made water-repellent permanently by a chemical that withstands laundering and dry cleaning and that cannot be removed by any known solvent. Use of the chemical, an ammonium compound, for coating the clothing of armies is seen as one possibility. The clothing will not become heavy with rain or perspiration, yet the chemical does not close the pores of the fabrics, allowing evaporation of perspiration which helps to keep the body cool.

1980

Exercising "Swing" on Wheels Is Rowed Back and Forth

Exercising is made a pleasure by the invention of a rowing machine that travels as you row. It is a four-wheeled scooter attached to the ceiling by giant rubber bands. The operator pulls himself back and forth by grasping the two bars, and at the end of each swing the machine comes to a smooth stop.



When bars are pushed and pulled in rowing fashion, exercising "swing" is propelled back and forth

*Mr. Chris. Carsten
312 E. 6th St.*

Carter Carburetor Co.

9/10/08. Ceramic Filter For Auto Cleans Fuel of Particles

Foreign matter may be removed from gasoline by using a new ceramic filter developed for automotive engines. The makers claim that it will keep out particles fifteen times smaller than those visible to the eye. A top thumb nut clamping feature facilitates cleaning of the bowl or changing the cartridge. Pulsations in the line are cushioned, assuring an even flow of gasoline to the carburetor.



1965 Tulip Harvester and Crew Dig 20,000 Bulbs per Hour

Operated by a crew of seventeen men, including the tractor driver, a tulip harvester handles 20,000 bulbs, or about eighty full boxes, in an hour. Standing along the sides of the twenty-three foot machine, men sort the valuable bulbs as they are carried toward the rear by endless belts. It rides on four sets of wheels, and the front section is articulated for convenience in steering at the ends of rows.

Big Funnel Gauges Sky Heat and Helps the Weatherman



Inventor is shown with giant funnel with which he claims the temperature of a drop of water one mile up can be measured.

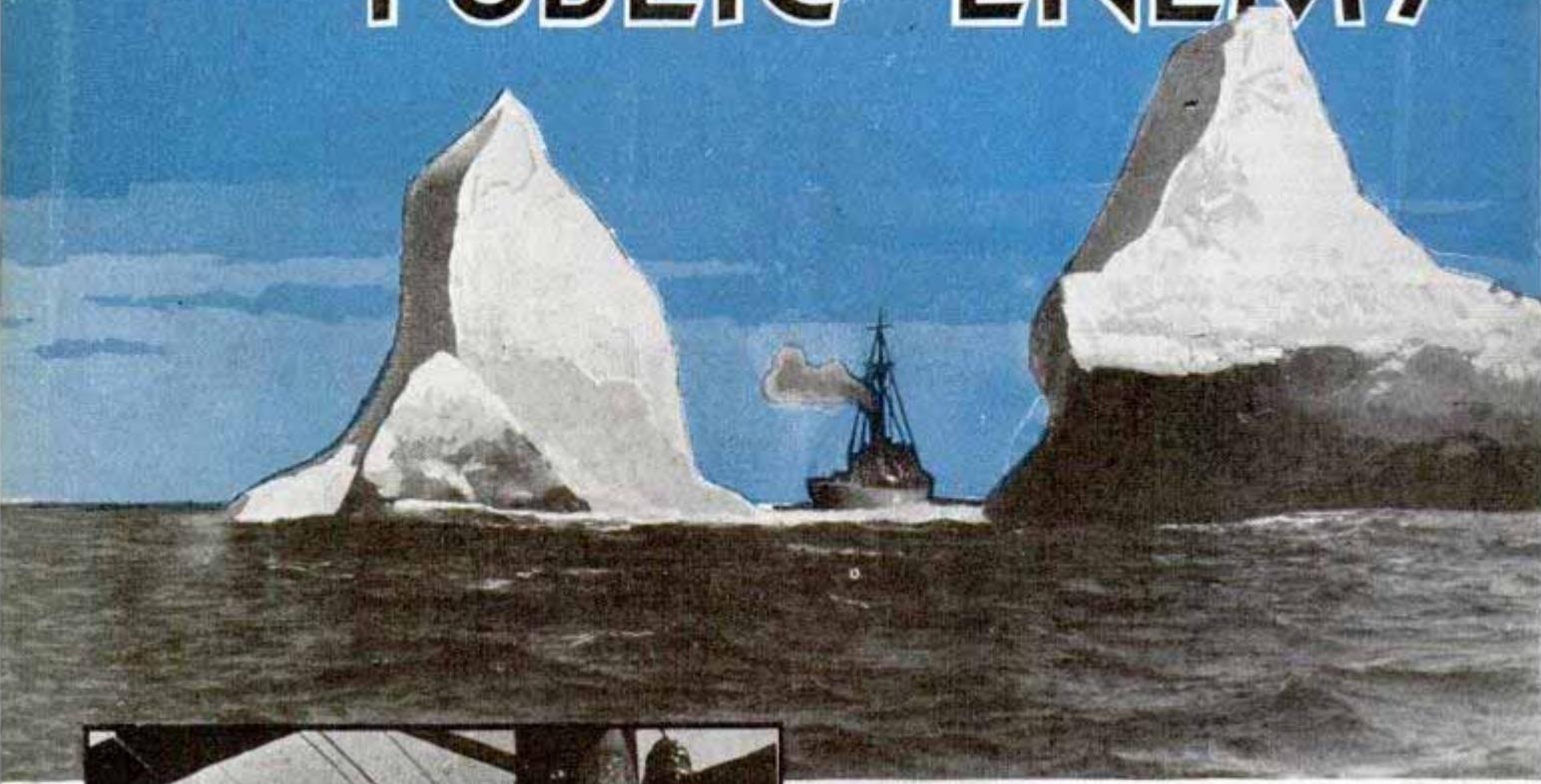
Devised to measure the temperatures high above the earth, a giant funnel-like instrument has been developed as an aid to the weatherman. By concentrating the light of the sky on a "cascade" of mirrors, the inventor, Dr. C. H. Heck, claims that he can detect changes in temperature in the upper atmosphere which make possible the prediction of the weather for the next twenty-four hours.



Men standing on running boards sort tulip bulbs as tractor-drawn harvester digs and moves them along on endless belt at rate of 20,000 an hour.

Built by Moore Machine Shop, Inc., New Haven, Conn.

G7762 PUBLIC ENEMY



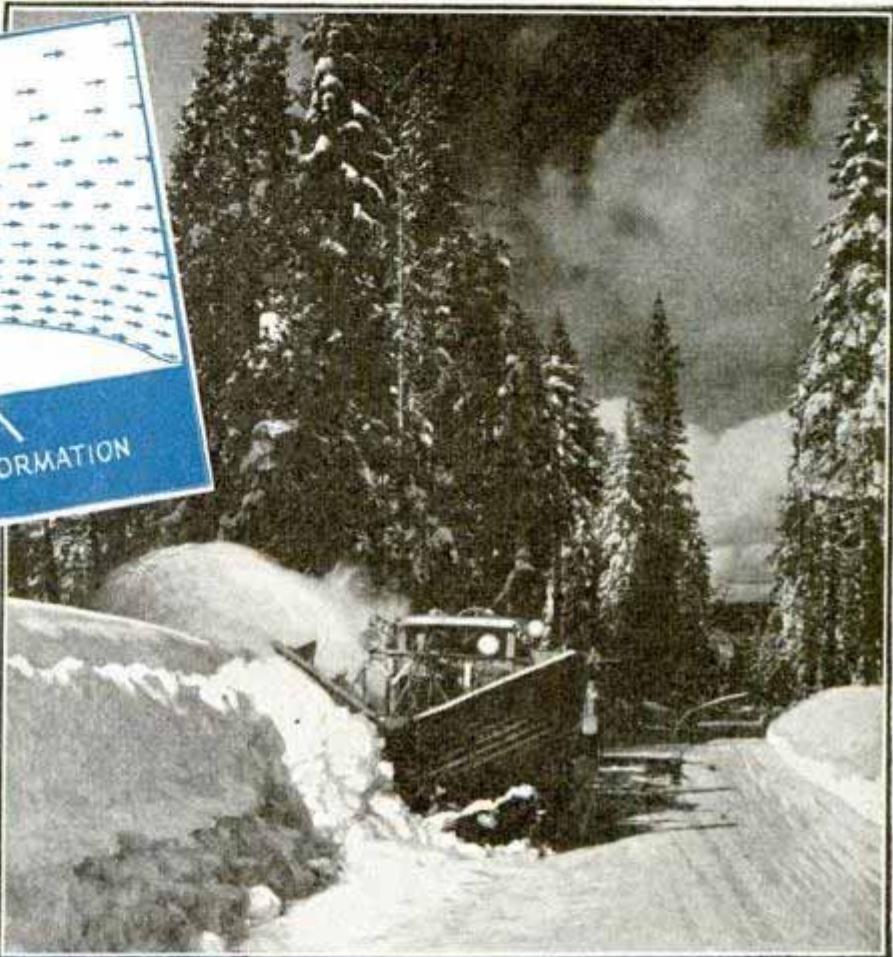
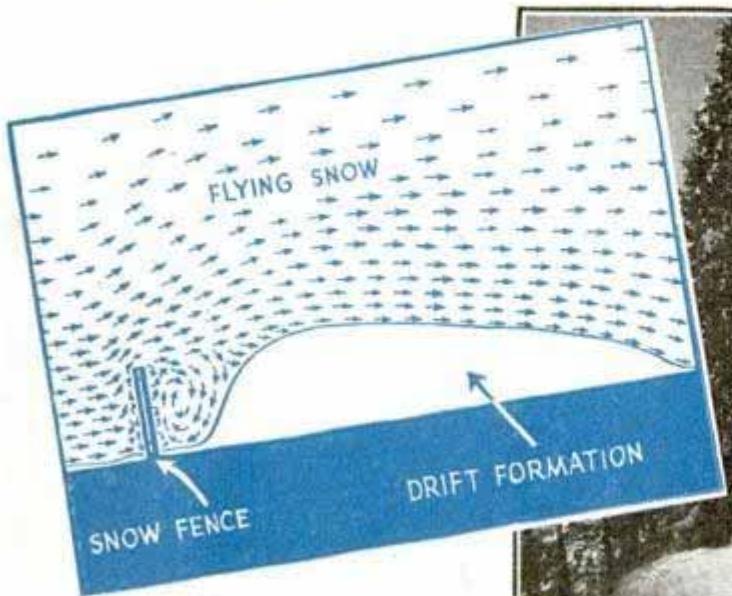
Winter's end marks the beginning of work for the International Ice Patrol. Coast-guard cutter, top, guards icebergs in north Atlantic shipping lane. Below, a lineman strings temporary wires after storm

WHEN Arctic winds sweep down from the north, when the mercury plunges toward zero, when the weather man predicts snow or sleet or extreme cold, it means battle to thousands of men.

Our modern civilization is a tender thing, of delicately adjusted nerves and arteries. Block those nerves and arteries, block the means of transportation and communication, and disaster is close at hand. Cold weather, with its ice and sleet and snow, attacks us first through those nerves and arteries; and an army must be mobilized to fight it. That weather report you read in your evening paper is the mobilization order. "Colder," it says, "and snow or sleet." You dismiss it with a shrug, but down in the railroad terminal and freight yards grim-faced men are gathering. At the first flurry of snow, gas or oil heaters are lighted under switches and men patrol them with broom and pike. No ice or snow must be permitted to clog them so they will not open and close properly. Semaphore signals must be watched, for a coating of glaze or sleet will freeze them so they will not move. Often it is necessary to place watchmen at each of thousands of signals, to prevent their freezing by working them periodically by hand.

Mr. Herbert J. Webb, Apts. ?
Buckingham Apts. 4322
Second Road N., Arlington,
Va.

NUMBER ZERO



How snow fence controls formation of drifts (upper left); snow-plow clearing road in Sierras (right), and seven-inch deposit of wet snow on three-sixteenths inch electric-light wire (below). The snow weighs approximately fourteen ounces to the foot.

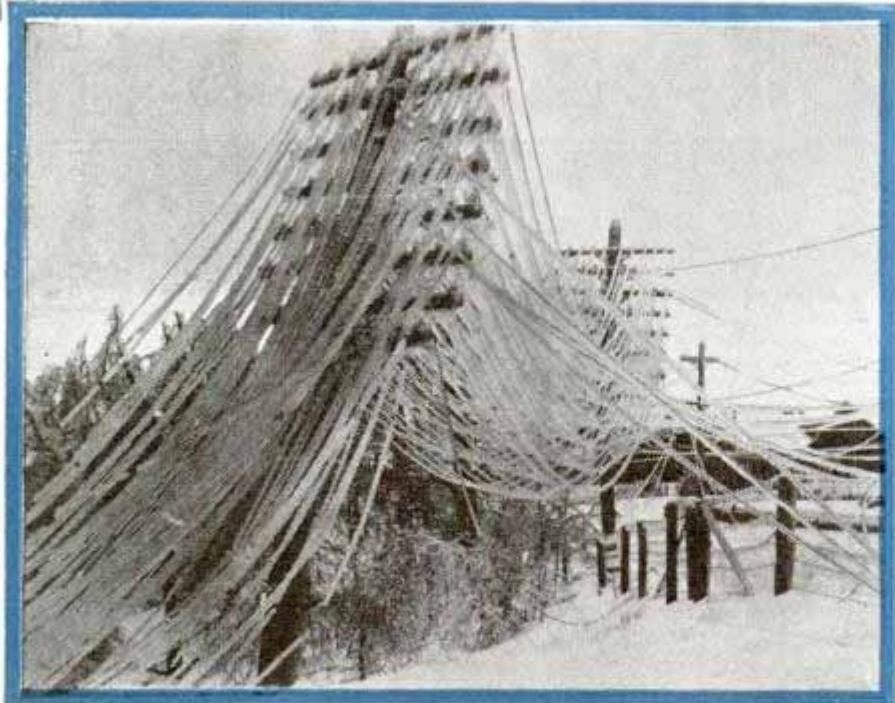


Railroad men believe the way to lick a storm is to keep on top of it. Instead of waiting until snow is deep enough to stall a train, locomotives equipped with flangers are sent out to keep the tracks open; while great rotary plows stand by in case the snow gets too deep for the flangers. It is seldom that a mere snowfall can get ahead of them, but when high wind accompanies the fall, drifts several feet deep often pile up in a few minutes. In such cases snow trains are necessary—rotary plows pushed by two or more locomotives, with other cars for workmen and their tools. These men follow the train on foot, shoveling away loose snow from the tracks after a channel is plowed through the drifts.

Where drifts occur regularly, millions of dollars are spent to forestall them. In the mountain states snowsheds are built. In flat country one

Springfield Mo

Worcester Mass.
Nov. 26-29, 1921



may see thousands of miles of snow fence erected beside the track. But despite these precautions, drifts have been known to pile up higher than a locomotive in two or three hours. The railroads spent nearly fourteen million dollars last year fighting snow and ice.

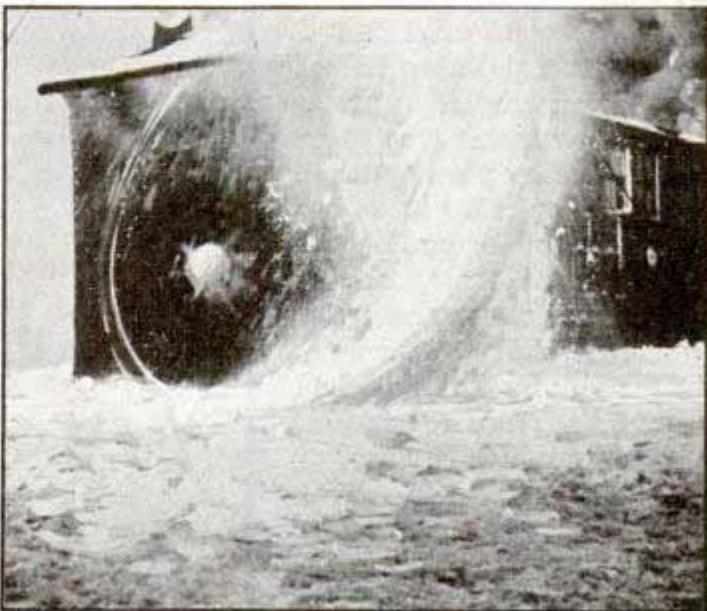
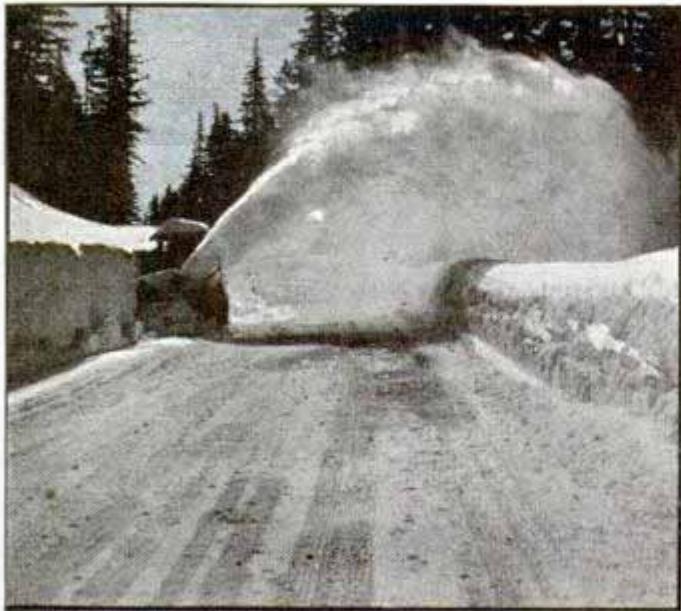
Street railways have the same problem, complicated by several other factors. Overhead wires collect icicles and glaze that prevent contact of the trolley. Special scrapers must replace trolley wheels to clear the wires. In Washington and New York, where the underground conduit system is used, the slot fills with drifting snow,

or slush tracked in by autos. Sometimes this can be cleared by pouring kerosene in the slot and igniting it, with a plow following to push away the resultant slush. In severe cases it is necessary to tear up all the plates along miles of line and clean the slot with hand tools.

But even when the transit company clears its own lines, its troubles are not over. Car-line streets are often the only ones open, and are quickly blocked by motor traffic stalling on the tracks, while the demand for

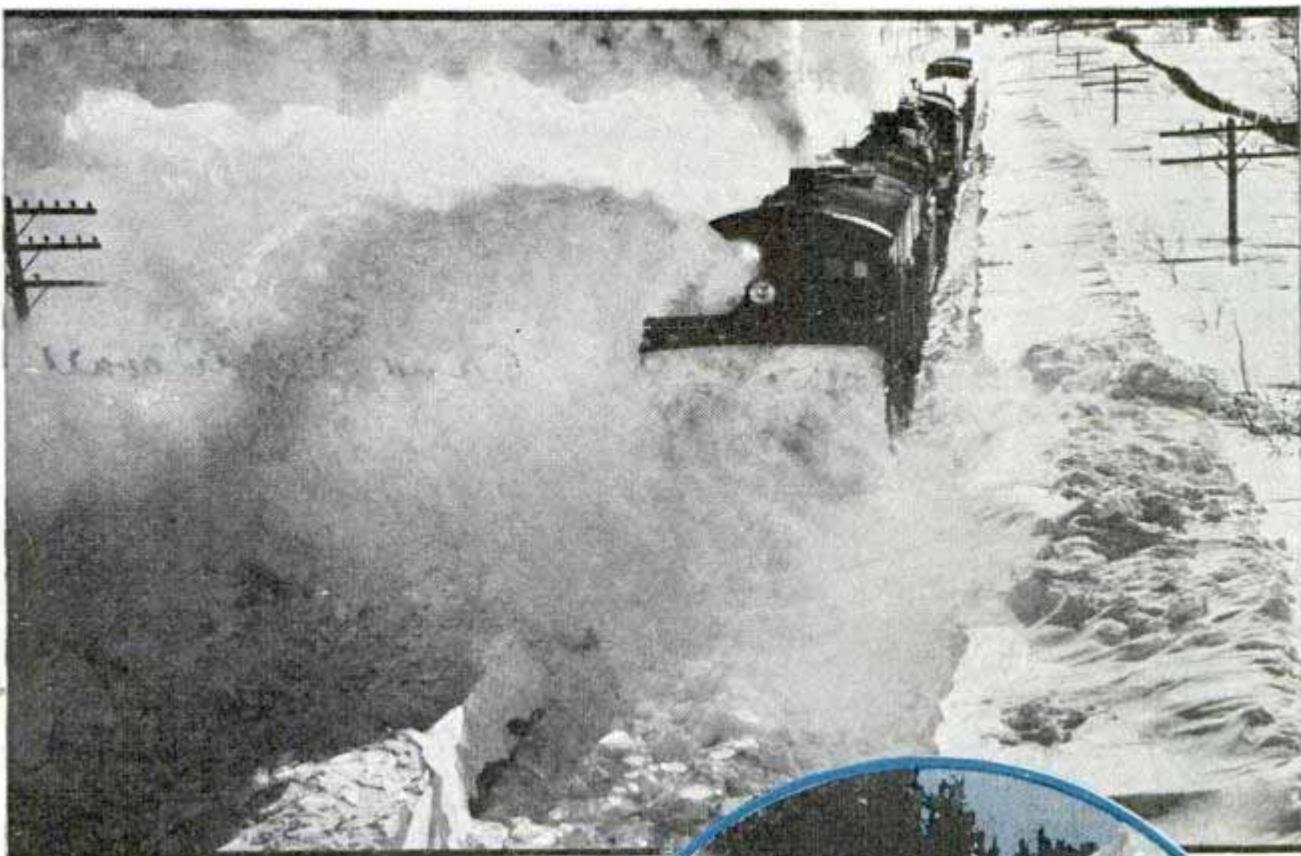
street cars trebles because most auto owners leave their cars at home during the storm. Automotive traffic also tends to pack the snow so hard on the tracks that it causes derailments. However, traffic is seldom tied up more than a few hours. In one heavy Chicago snowfall 1,111 miles of car track and 154 miles of bus routes operated all during the storm, and normal schedules were restored within twenty-four hours. But it took 1,500 snow fighters to lick the fifteen-inch fall, assisted by 220 plows and sweepers.

Seventeen million dollars is the annual cost of keeping our 217,000 miles of main

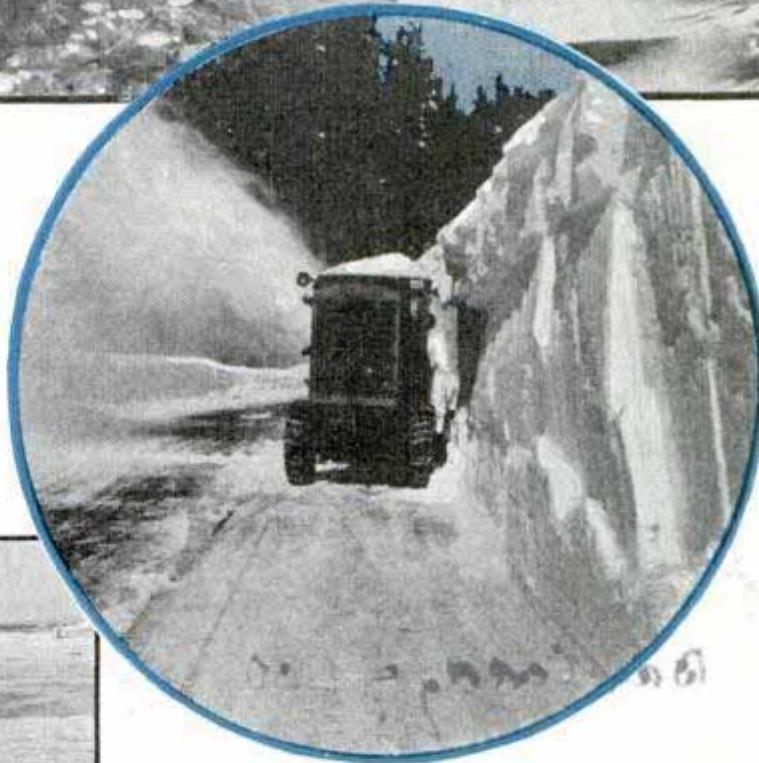


Ice three inches thick weighing 800 pounds per wire coated lines in Massachusetts storm, top. Below, rotary plows fling high a shower of snow to clear a highway in Oregon and a Minnesota railway

Maria Sylva R?



highways open during the winter months. In one mountain pass 469 inches of snow fell last year; yet that pass was kept open to motor traffic during all but a few hours of the season. In the mountainous state of Washington, snow-removal activities are directed by radio, the central office dispatching snow fighters to the scene of



Top, snow train clearing Milwaukee Railroad line; center, digging canyon through mountain pass. Below, cutter rescues ships frozen in Detroit river ice

battle by means of two-way radio installed on plows and trucks.

A large part of this highway snow battle is fought in the summer, and by engineers rather than plow drivers and shovel men. Road grades are being raised above adjacent ground, slopes are flattened, cuts are reshaped, to provide windswept surfaces. Trees and shrubs are planted as snow barriers, miles of snow fence are erected. Wider ditches are dug and roads are cambered to provide better drainage.

(Continued to page 126A)

Tahoma

Venetian Window Awning Controlled from Indoors



Adjusting the vanes of the outdoor Venetian-type awning by a chain inside the window

Protection from the sun without cutting off light and air is afforded by a Venetian-type awning just introduced. Hung outside the window, its vanes can be controlled from inside the house by a pull chain. The vanes and all parts are of metal, eliminating any expense for replacement.

Four-in-One Tool for Kitchen

Has Opener in Handle

Bar ready for use



Combining an ice hammer, cap remover, corkscrew and jigger, a four-in-one accessory for the kitchen is now on the market. For use as a measuring cup in cooking, the head of the tool holds a full two ounces and is marked on the outside for measuring one and one-

half ounces, one ounce, and three-fourths ounce. The closed end of the cup is weighted and rounded to serve as an ice hammer. All pressed-on bottle caps are easily removed with the handle, and when a corkscrew is needed the handle is unscrewed.

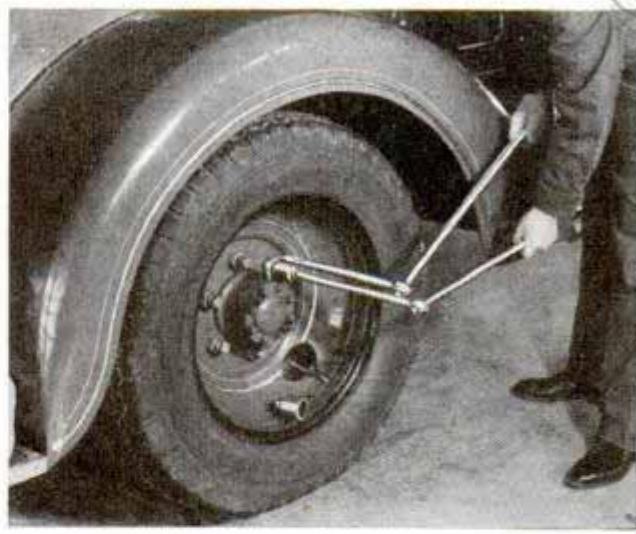
Diesel Electric Generating Unit

Delivers Low-Cost Power

6 and 20 kilowatts
Electric power at about one cent a kilo-watt-hour, with all operating costs except depreciation included, is produced by a Diesel driven generator just developed by the Caterpillar Tractor company. Intended for use on the farm, in logging or construction camps, airports, sports arenas and the like, this low-cost generating unit is quickly installed. The first such generator sold was put to work lighting a midget-auto race track, and was in service twenty minutes after it was delivered, furnishing current to twelve 1,000-watt lamps at a cost of about 10.4 cents an hour. All electrical equipment needed is built in, except the circuit breaker.

Wrench for Dual Wheel Work

Turns Two Nuts at Once



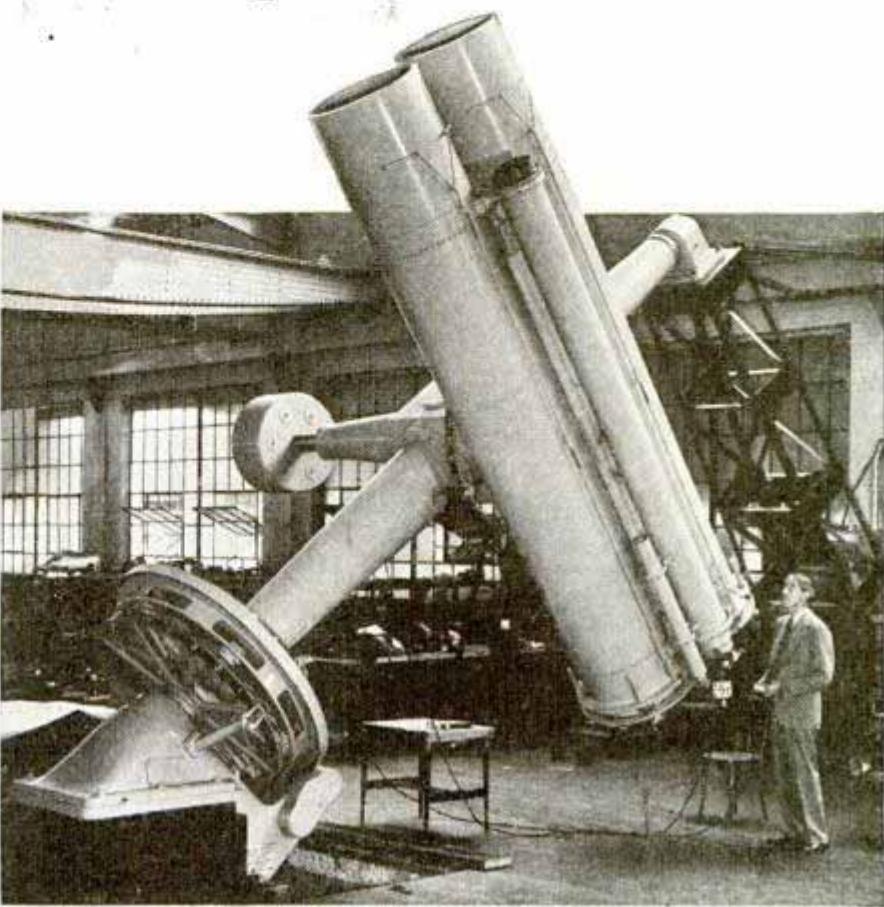
Handy two-in-one wrench which speeds up work on truck and bus tires

Repair work and tire changes on dual wheels of automotive vehicles may be speeded up by using a combination wrench that turns two nuts at the same time. Operated by one man, it removes the outside hex and the inside square nut at once. It also can be used for "spinning" nuts on or off and for general service work.

'Double-Barrel' Telescope Takes Two Photos

Cnf. Emil A. Berg / 31 December 1962

Having two large and two smaller tubes, a camera telescope, known technically as a "double astrographic camera," which will be used in studying the Milky Way, was completed recently for Lick Observatory atop Mt. Hamilton, Calif. The two main tubes, each fifteen feet long and twenty inches in diameter, are used only for making photographs. A third tube, equipped with a ten-inch lens, is the "guiding telescope," and the fourth one, having a three and one-half inch lens, is the "finder" used for the preliminary location of the instrument. Two seventeen by seventeen-inch photographs can be taken simultaneously with the telescope, making it possible to get identical pictures with blue stars bright on one negative and red stars bright on the other. Or it can make dupli-



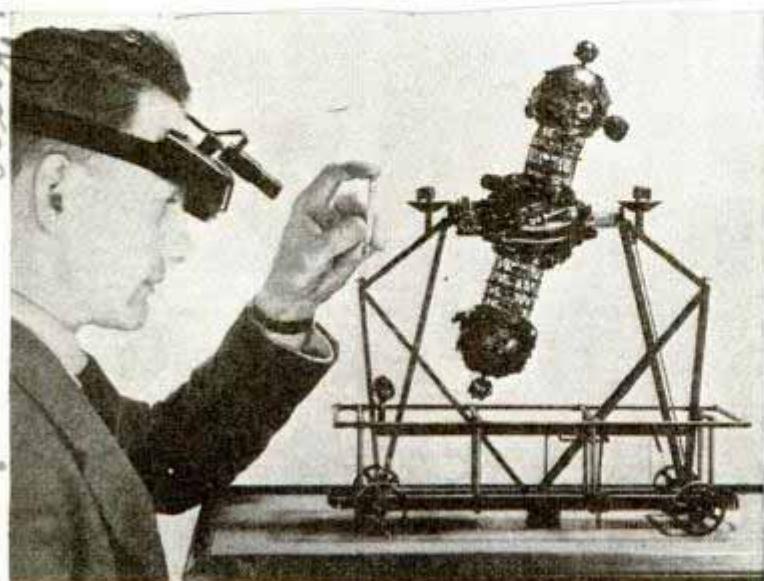
Twin cameras of double-barrel telescope can make two identical photographs of stars. Instrument is used in making study of Milky Way

cate negatives of each picture. All four tubes with their counterweights, weighing four tons, are on a single axis or mounting.

Tiny Model of Planetarium Has Two Thousand Parts

An exact reproduction of the projector used in Hayden Planetarium in New York

Smithsonian Institution
City is the result of three years of patience and expert workmanship. Containing more than two thousand parts, all hand made of brass and copper, the twenty-pound model is built to a scale of one to eleven. The original, a Zeiss Planetarium instrument, weighs two tons. Connected to a one-sixteenth inch driveshaft, a tiny motor revolves the projector completely in forty-five seconds.

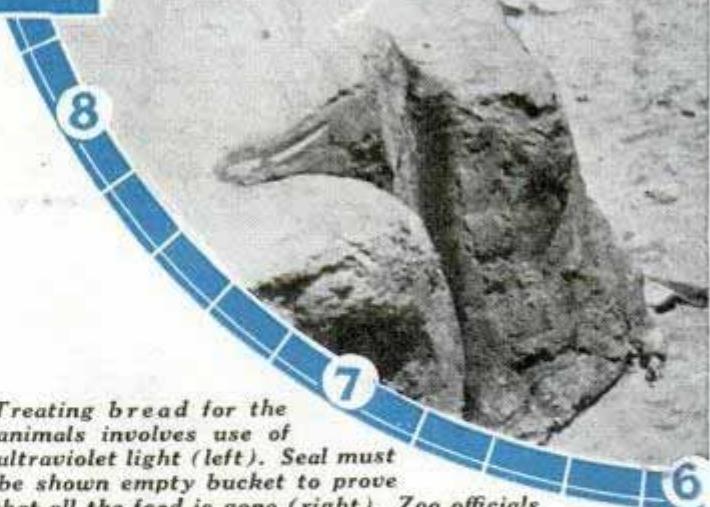
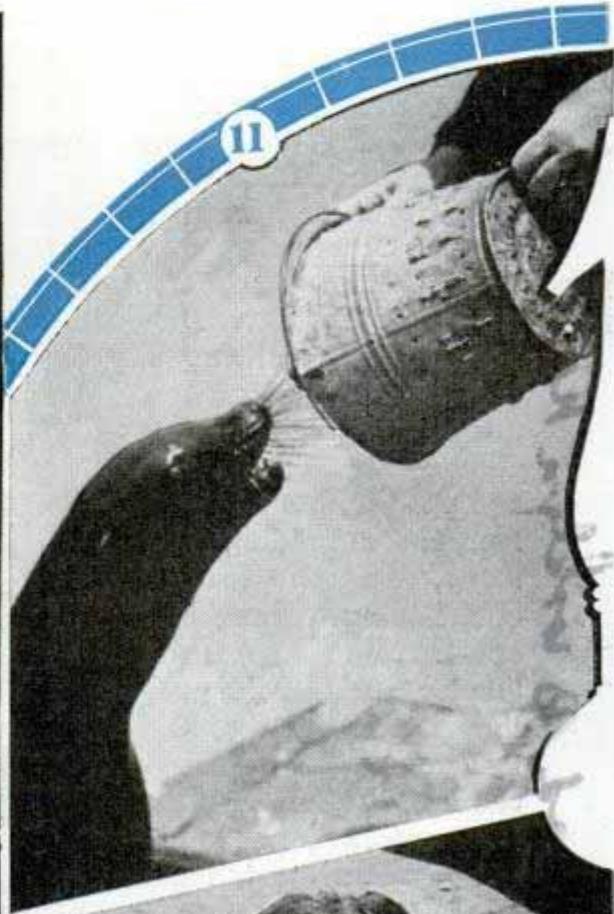


Builder putting finishing touches to miniature planetarium

More energy from solar heat could be obtained in the state of New Mexico alone than now comes from all the coal, oil, and water consumed in the United States annually for generating heat, light and power, says Dr. C. G. Abbot, an authority on solar radiation.

8 129 Mr. & Mrs. Miller
457 S. Serrano Av.
Los Angeles, Calif.

DINNER TIME at the



Treating bread for the animals involves use of ultraviolet light (left). Seal must be shown empty bucket to prove that all the food is gone (right). Zoo officials must watch monkey's diet carefully (below)

After many years of research, the staff of the Griffith Park Zoo at Los Angeles has worked out a scientifically accurate method of feeding animals which has cut the death rate to such a surprising degree that zoos throughout the world are studying the system. But there's one hitch in the system worked out by Superintendent Byron C. Gibson. That's the Sunday diet the animals get from zoo visitors.

Such items as bath towels, pearl breastpins, ping pong balls and bottles of poison are obviously not conducive to animal well being. But even such traditional tidbits as peanuts, popcorn and carrots are often dangerous to the health of the inhabitants of the cages. That's the reason for the innumerable little signs, "Do Not Feed the Animals."

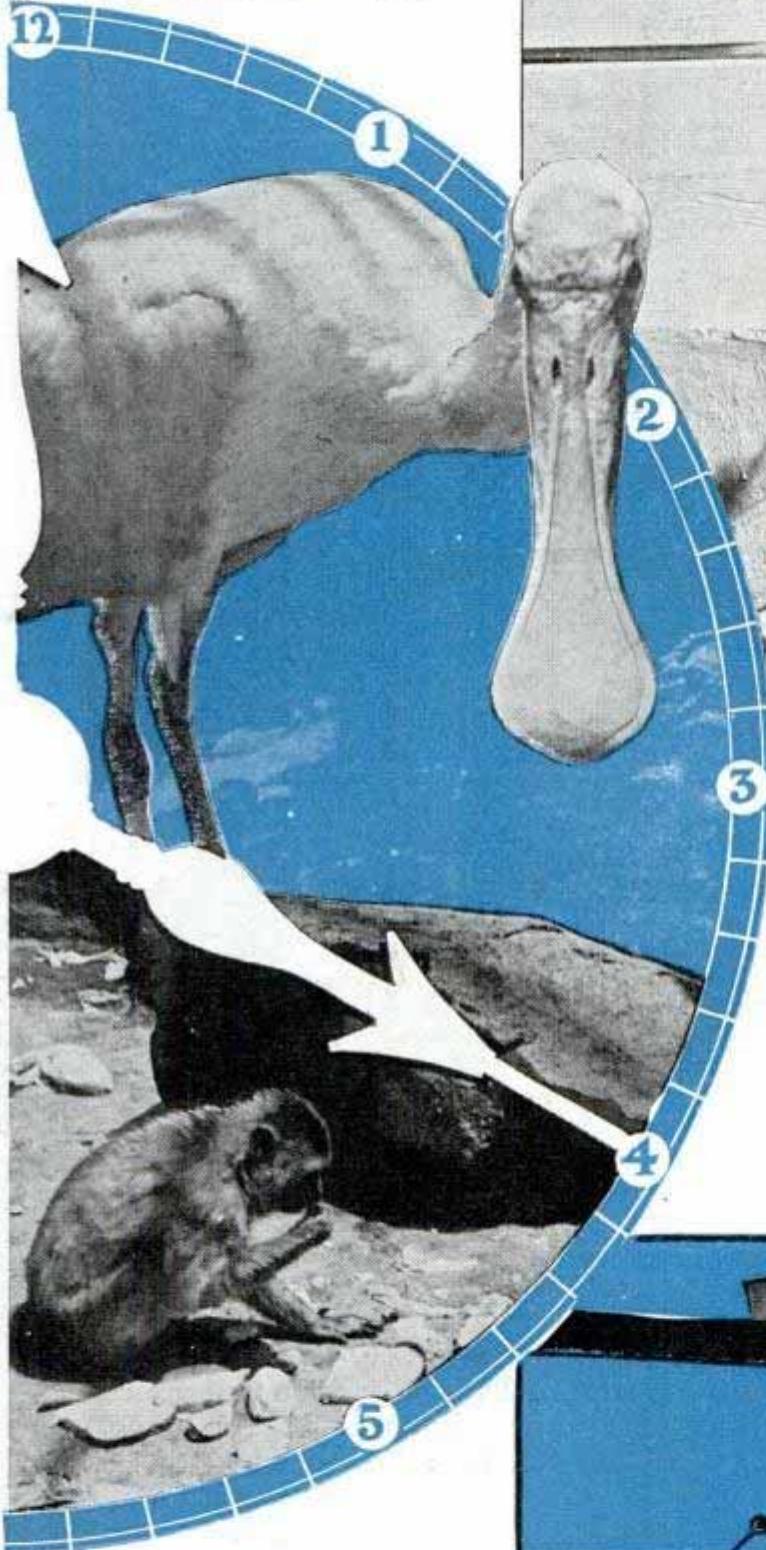
There are a lot of people who claim that their right to feed the animals is guaranteed by the Constitution, or words to that

effect. It would do such people a lot of good to take a peep behind the scenes and see a few of the problems of modern zoo feeding.

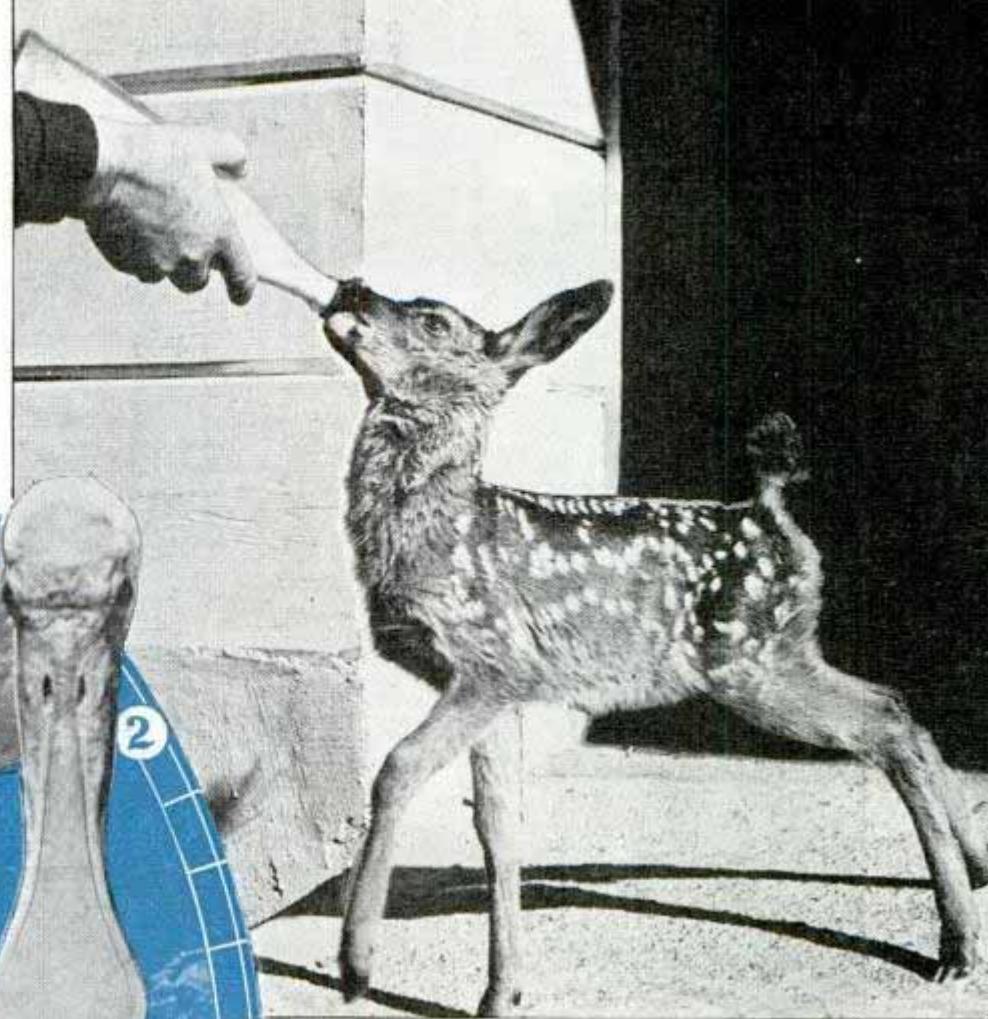
For instance, you've got to be sure that the baby octopuses arrive promptly on Friday morning. You see, baby octopuses

2929.

ZOO



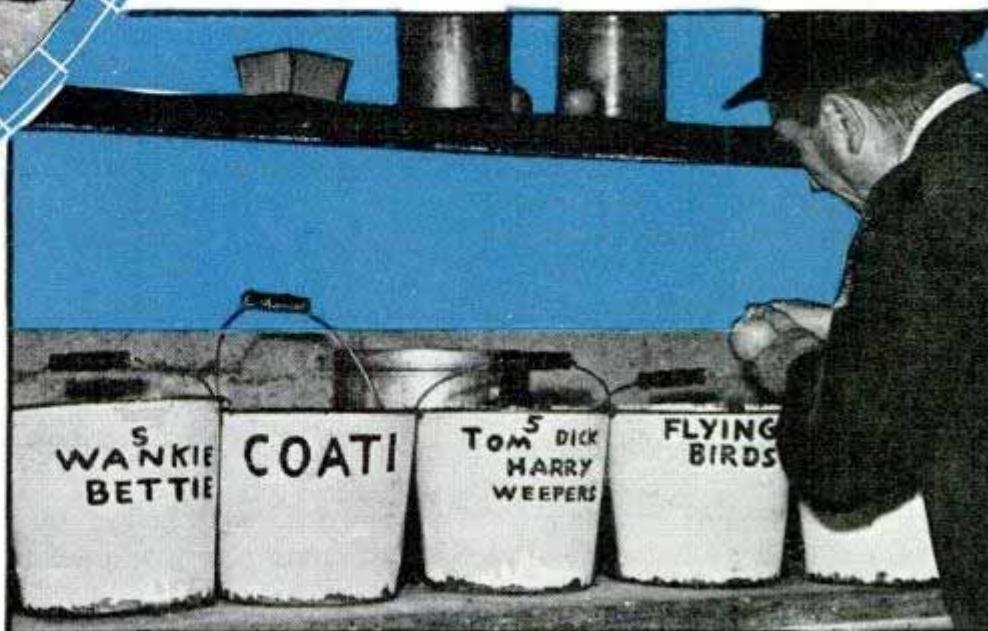
Upper part of circle, rare spoonbill fad unless he gets his shrimp. Top, warm milk is fed week-old fawn. Bottom, right, private dinner buckets are reserved for more particular animals



contain a high percentage of iodine, and seals need iodine. If they don't get their octopuses regularly, they become listless, lose weight, and present a pretty sorry appearance. One day as the seals' special bucket was being filled with octopuses, a wildly excited zoo attendant dashed into the feed house.

"Somebody's thrown a pearl breast-pin into the seal tank," he yelled, "and the pin's open! I saw it!"

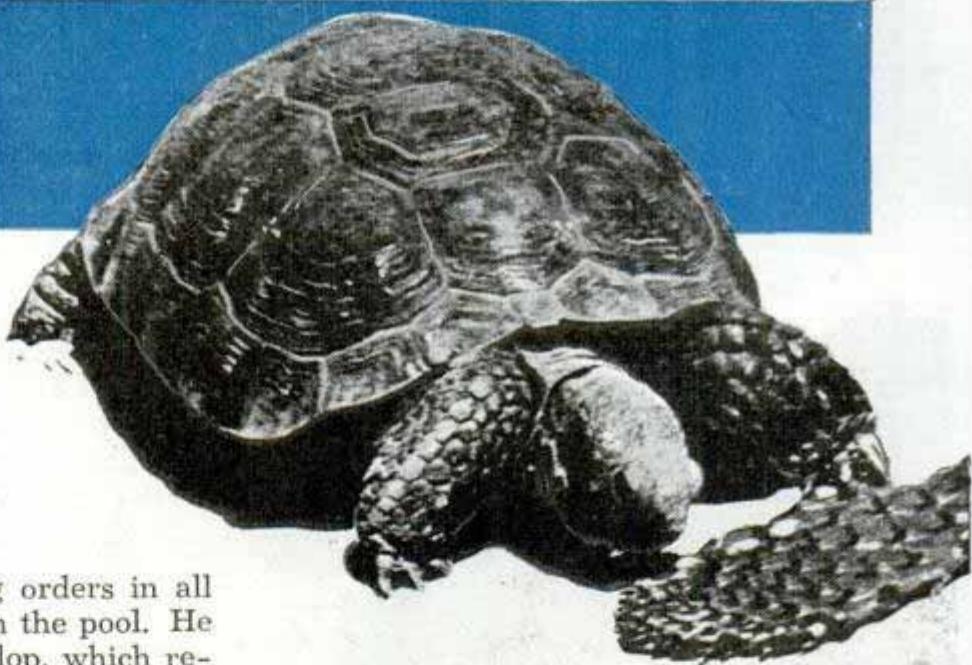
A split second later the feed house





"Yogi,"
dwarf Kodiak bear

Above, dwarf bear getting her bread, but she doesn't like it.
Below, gopher tortoise nibbling a fresh piece of cactus
—rather a prickly dinner



was empty. Gibson, yelling orders in all directions, was first to reach the pool. He called the seals, Flip and Flop, which responded to his familiar voice, and slithered up the bank. There they were captured and hustled away. In the meantime, valves had been opened, and the group watched the water ebb from the tank. When the bottom of the huge tank came into sight, one of the assistants spotted the pearl pin—and it was open. If it had not been for the quick work on the part of the staff, the pin eventually would have been spotted by one of the seals and gulped down, the open point perhaps causing death.

But such dramatic occurrences aren't as important as constant scientific study of the reactions of various animals to different foods. One of the most recent advances in this field has been in the realm of vitamins. To insure a high vitamin content,

much of the food is treated with ultraviolet or infrared light. A recently developed extract which is twenty-five times stronger than cod-liver oil is fed to all animals. When a bear cub becomes listless and refuses to eat, it is fed honey sandwiches treated with ultraviolet light and impregnated with the vitamin extract.

Some birds change color if certain elements are absent from their diets. The "spoonbill," with a bill twice the length of its head, loses its delicate pink color if it doesn't get enough luminous shrimp. These shrimp are found in the Mediterranean—but that's a long way from Los Angeles.

"The only way I can keep enough shrimps on hand," Gibson declares, "is to

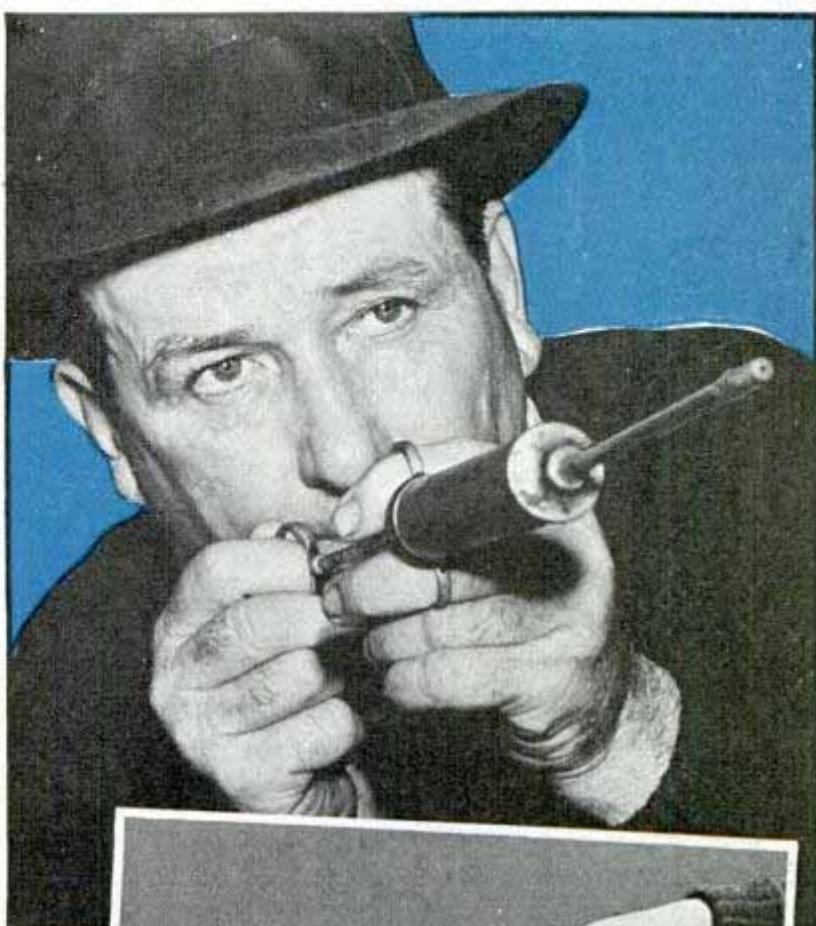
haunt the waterfront until I find the captain of a ship who will bring me a load of shrimps on his next voyage. Once in a while the shrimp run low, and the new load doesn't arrive on time. Then I don't dare look at the spoonbills and flamingos for fear they're beginning to fade."

Monkeys are not only particular about their food, but they also have the human trait of demanding constant change. The same food combination can't be used more than three days. They even get tired of bananas. When a monkey gets off its feed, it has to be intrigued with all sorts of tidbits. One of the most effective is raw peanuts. Roasted peanuts are never fed to the animals, because cooking destroys much of the vitamin content.

A particularly difficult feeding problem occurs whenever

(Continued to page 130A)

Top, syringe used by zoo superintendent to feed milk and eggs to a lioness. Below, seal must get his octopus every Friday. Bottom, left, dwarf bear pushes bread to one side, then enjoys the lettuce and carrots



"J'lop"

'Talkies' of Big War Events Recorded for Students



Giant recording platter on which words and voices of statesmen are recorded along with events of war

Momentous events of 1939 are preserved for future students who will be able to hear them repeated by playing big phonograph records. Not only the words, but the determined voices of leading European statesmen were recorded by General Electric's short-wave station during the crisis, and then rebroadcast.

J 1025

Rotating Brush Cleans Teeth and Massages the Gums

Thumb pressure on the lever of a mechanical toothbrush starts it rotating, ef-



Squeeze a lever with your thumb and this toothbrush spins, cleaning teeth and massaging gums

fectively cleaning the teeth while it gives the gums a beneficial massage. The brush is non-electric, its powerful little motor in the handle keeping the brush spinning for more than a minute on one winding.

J 1009

Polish Tube Built into Brush for Easy Shoeshining

Introducing a new way of shining shoes, a device now on the market combines a tube containing polish for fifty shines and a brush for applying the polish. The outfit is built to fit the hand. A turn of a small key releases sufficient polish to the brush



Turning key at top of brush feeds shoe polish from tube and permits application without soiling hand

for a quick, satisfactory shine. The user's hands do not come in contact with either the brush or the polish, thus eliminating the nuisance of soiling the fingers. Empty tubes may be replaced in the handle.

J 1042

"Coldest" Refrigerator to Run at 450 Degrees Below Zero

As the result of discoveries announced recently, the world's coldest refrigerator, operating at 450 degrees below zero, Fahrenheit, is in prospect. It would run on compressed helium, which when liquefied produces the coldest cold known to man, only a few degrees above absolute zero. At 450 degrees below zero all lubricants are frozen solid, so this difficulty was met by doing away with lubricants in the heli-

*Saline Service
9/7/36*

um engine and replacing the conventional engine piston with a flexible diaphragm of stainless steel. The diaphragm is sealed at its edges by a copper gasket between two steel plates, and expansion of the helium occurs between the diaphragm and one of the plates. Two or three such engines will be used in consecutive stages in refrigeration, since it is impractical to try to reach extreme low temperatures in one step down the temperature scale.

ture scale.

Two-Swivel Welding Vise Holds Work at Angle

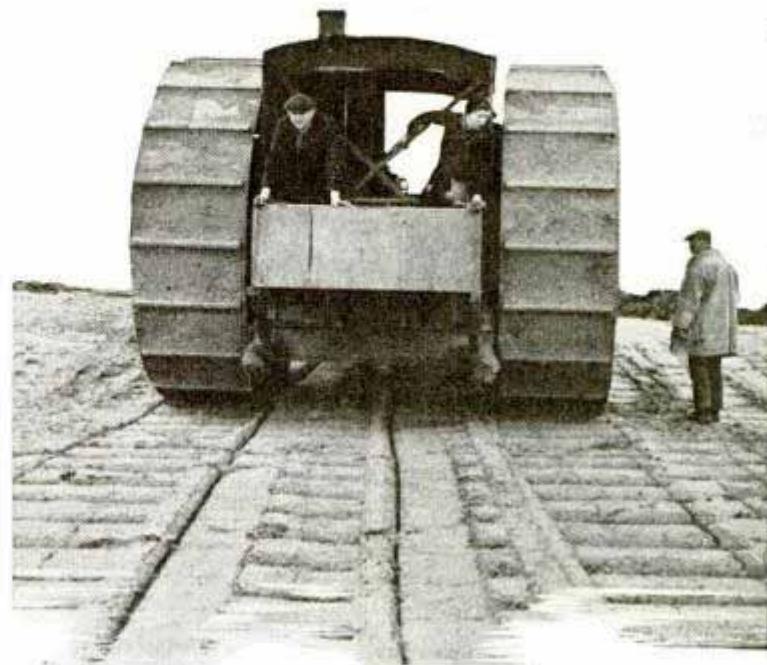
Faster and more accurate welding is said to be possible when a vise with a double-swivel arrangement is used, as it holds the work



Welding vise with double-swivel arrangement turns at any angle required by work

in the best position for doing the job. Although designed especially for welding, the vise, which is mounted on the workbench, can be converted easily into a regular swivel vise for ordinary work.

Steam Roller Rides Soft Soil on Wheels Twelve Feet Tall



© British Press Combine

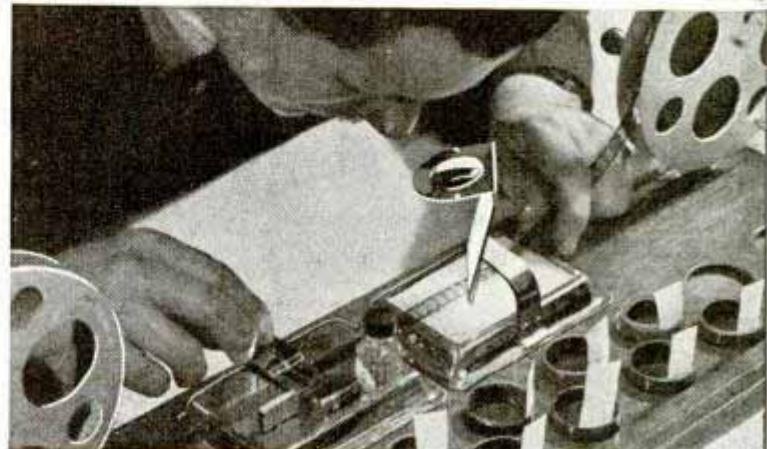
Twenty-ton steam roller is equipped with twelve-foot wheels to keep it from sinking into soft soil on wall of reservoir

Because the ordinary steam roller sank into soft soil, special wheels were designed for a twenty-ton roller used in building the wall around a new reservoir in England. The new wheels, twelve feet in diameter for the rear and six feet for the front, were large enough to keep the machine from bogging.

903

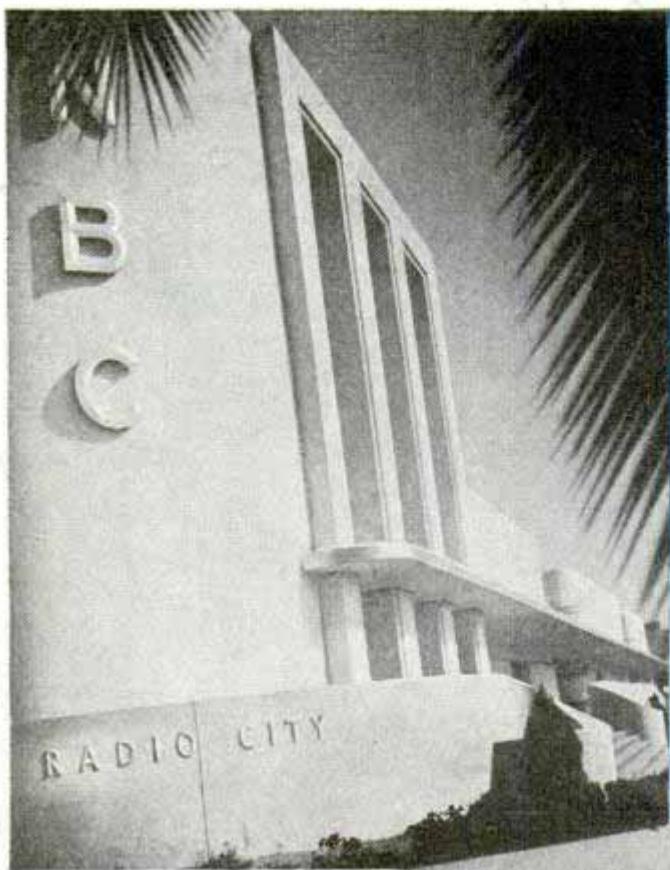
Magnifier and Mirror for Movie Films "Rights" the Image for Editing

To help movie fans in editing their films, a magnifying glass that may be attached to any editing machine is equipped with a mirror for reversing the image into upright position to make it easily readable. Only two screws are used in fastening it.



Movie film images and lettering “righted” by mirror for editing

21035 1935



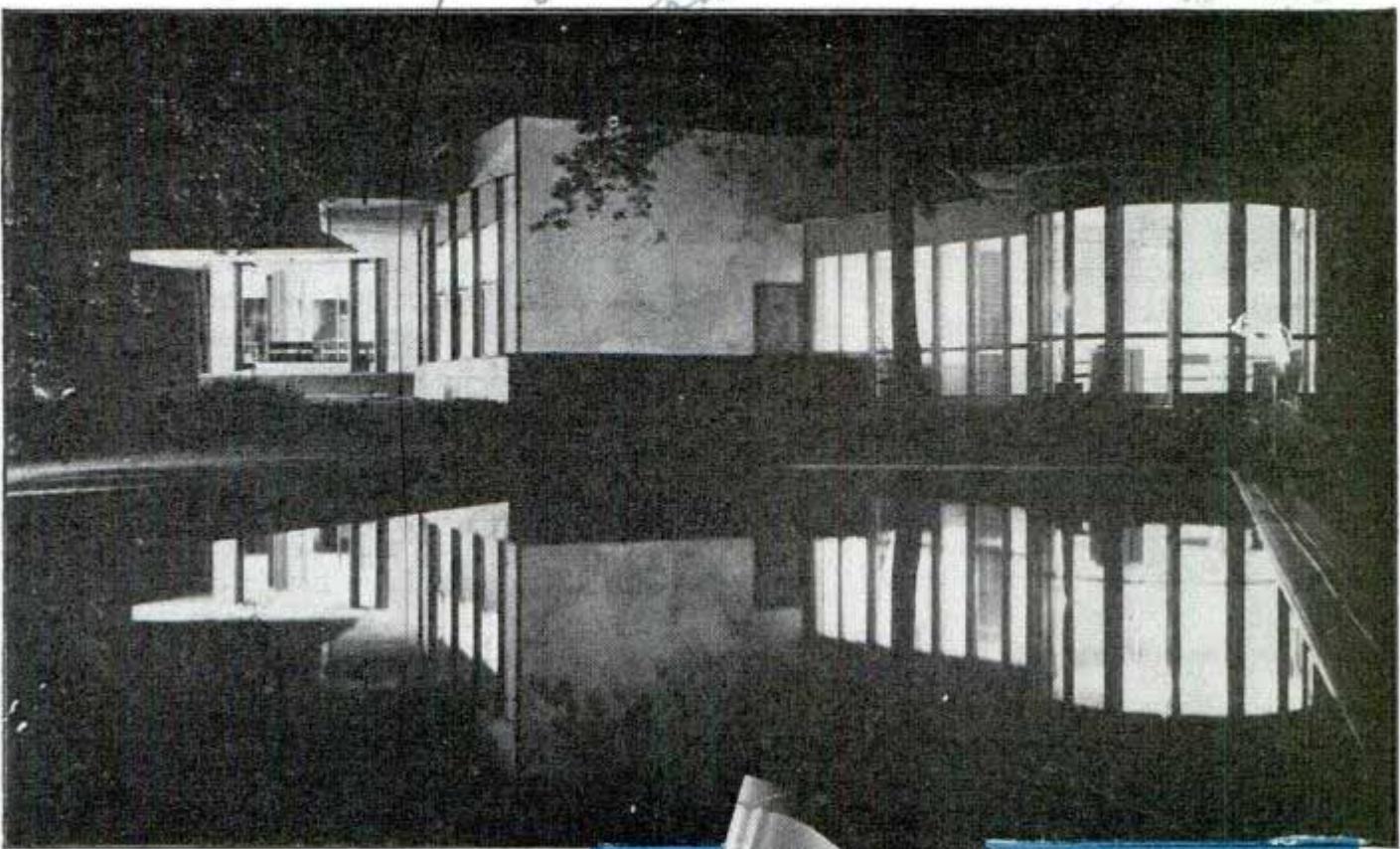
Building TOMORROW'S WORLD TODAY



The world of tomorrow is here. You need not travel to a world's fair to see it. True, it had a start in Chicago's 1933 exposition and gained impetus in fairs of '39, but industry is already at home in the future, in buildings shaped to perform functions efficiently instead of following tradition. Top, Hollywood studios of N.B.C., made of tinted concrete with aluminum canopy. Center, research laboratories of American Rolling Mills have porcelain enamel, stainless steel and glass walls. Below, simple lines characterize Campana company plant at Batavia, Ill.

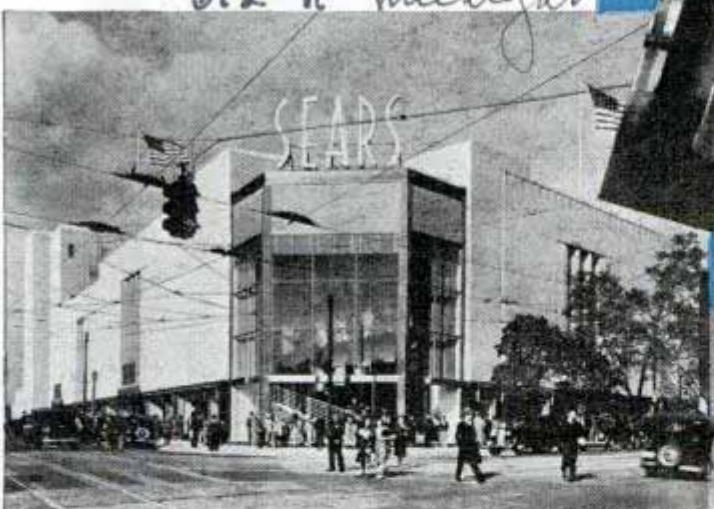
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Architect
B & G
Dwight

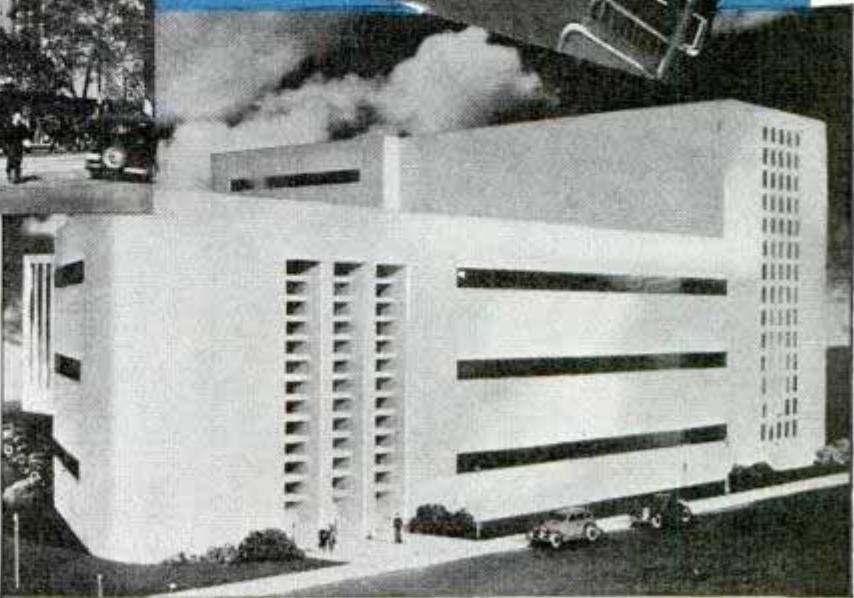
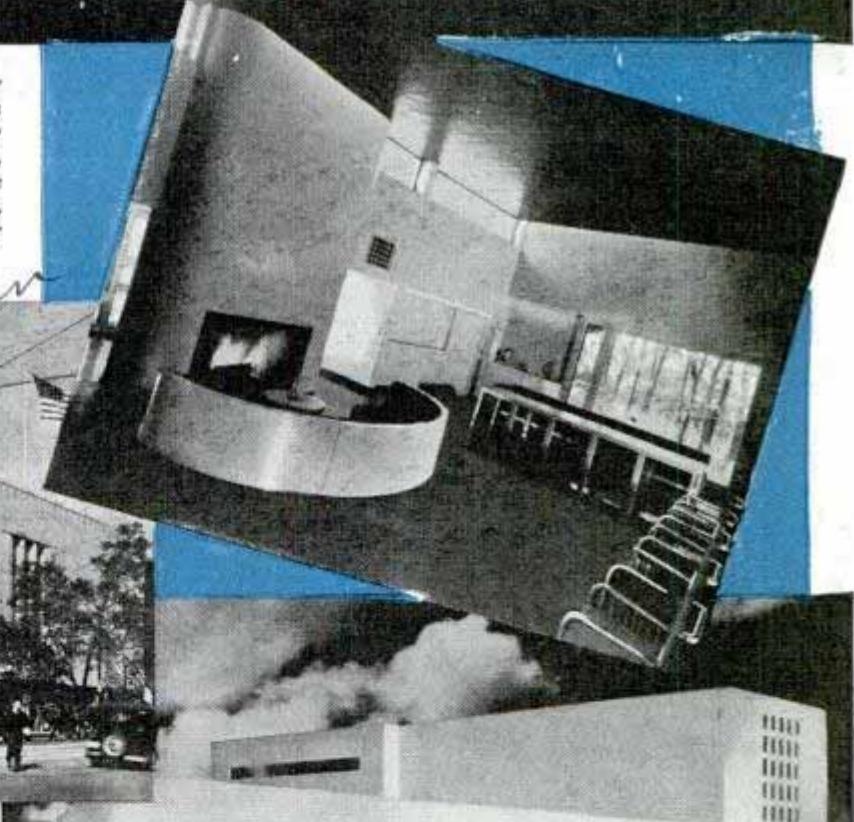


Above, night view of home designed by Architect George F. Keck, Chicago, in answer to demand for a "house of day after tomorrow." Right, living room, with dining table against window. The house has exterior Venetian blinds, rubber-tile floors, and is arranged for minimum housekeeping effort

612 N Michigan



Windows are abolished in the modern store and factory. Scientific lighting, often with the new fluorescent tubes and with daylight coming through glass-block walls, saves maximum space for sales display and machinery. Environment is under complete control, air-conditioning systems providing optimum "weather" for work. Above, windowless Sears, Roebuck & Co. store in Baltimore. Right, model of factory just completed for Church & Dwight, soda manufacturers



Portable Radios in Planes Entertain Passengers

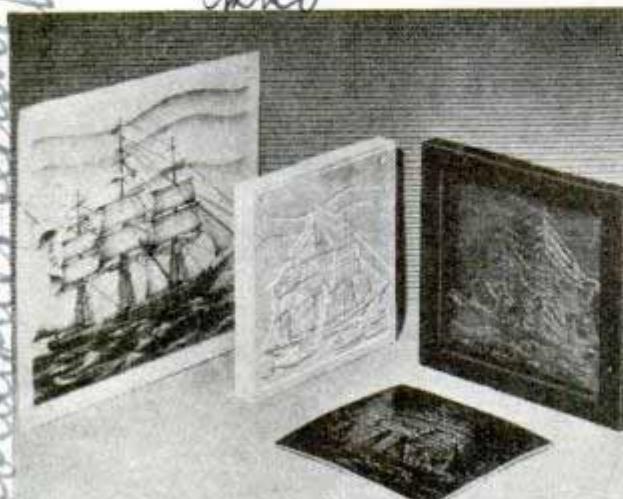


Portable radio set in airplane brings latest news reports and entertainment to flying passengers

Air-line passengers may receive the latest news bulletins or other radio programs by means of portable battery-powered sets installed in planes operated by Eastern Air Lines. Reception is reported excellent under most atmospheric conditions.

Iron Molds Make Exact Copies of Large and Small Objects

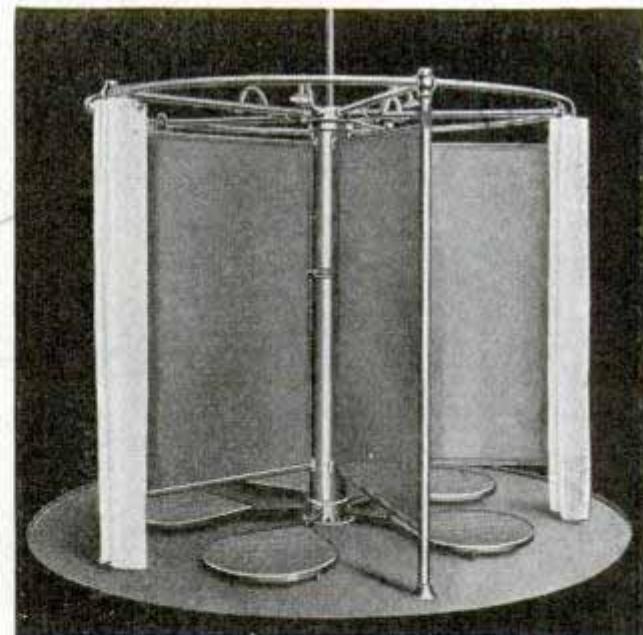
Iron molds made by a newly developed "electroforming" process are being used to



Iron mold, right, obtained from relief copy of drawing. Foreground, plaque reproduced from iron mold

reproduce with great fidelity such delicate objects as human hands, leaves and phonograph records. Patterns with 7,400 tiny lines to the inch have been reproduced in this electrodeposited iron. The process consists of coating the object to be copied with a layer of iron about one-third of an inch thick, this electrodeposition taking two weeks; then separating the metal from the object and filling the mold with the material from which the reproduction is to be made. Since these iron molds can be made from plaster casts, it is possible to produce feet, hands or limbs that are accurate copies of those lost by accident or surgery. Three artificial hands of rubber sponge have been made by this process to replace hands lost in accidents. It is also being applied to rubber and plastic molding, ceramics, metal stampings, jewelry, silverware and glass; and the largest iron molds so far made were for auto tires.

1833 Safety Shower with Heat Control Is Operated by Treadles

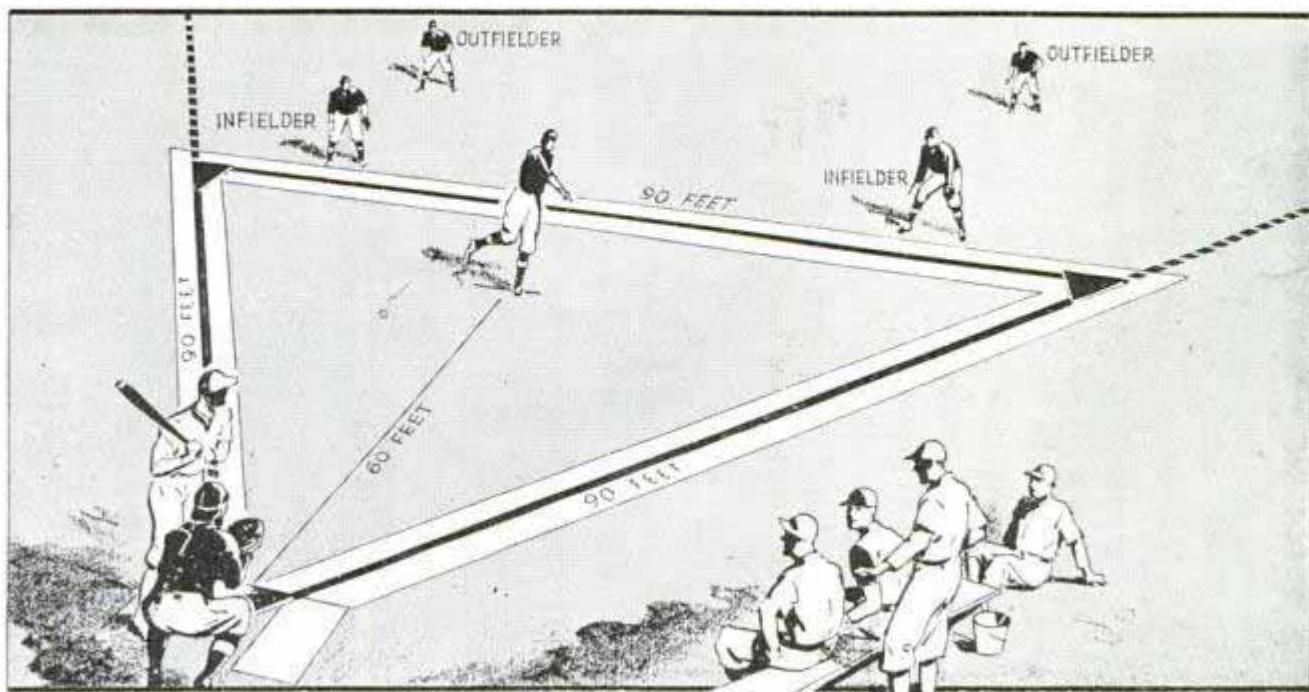


Pre-mixed shower, thermostatically controlled, is turned on when bather steps on the treadle

Danger of scalding under the shower bath is eliminated by pre-mixing the water in a thermostatically controlled shower unit developed for schools, factories, playgrounds and institutions. The water is turned on automatically when the bather steps on one of the non-slip treadles and stays on until he steps off. This system prevents waste of water.

Bradley's Wash. 2227

Six-Man Baseball Played on Triangular Field



Faster baseball games, requiring only six-man teams, are played on three-cornered "diamond." Two outfielders and two infielders have no less ground to cover, and players come to bat more often

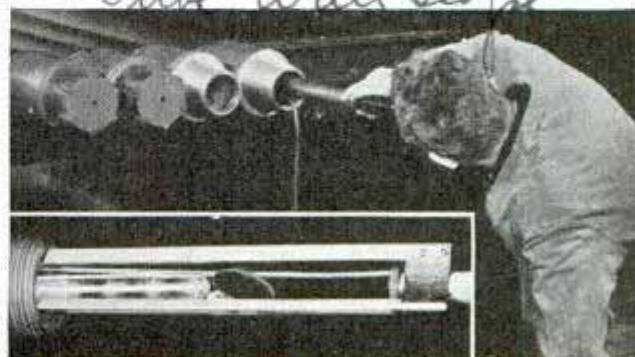
Already proving popular in some localities, a six-man-team adaptation of baseball developed by Stephen Epler, who five years ago originated six-man football, is especially suited to small-town schools having a limited student enrollment. Six-man baseball requires a smaller playing field and less equipment than its big brother, and permits wider flexibility of the rules. Each team is composed of six players—two infielders, two outfielders, a pitcher and a catcher. Instead of four bases, the "diamond" is composed of three, including home plate. Bases are equal distances apart—ninety feet when a hard ball is used—and they are located at the cor-

*Chester
nebr.*

ners of an equilateral triangle. A full game is six innings, and two strikes, instead of three, retire the batter. Foul balls are counted as half-strikes, and the hitter is called out on four fouls. Three balls, instead of four, give a base on balls. A player removed from the game may reenter in the following inning, but only when his team takes the field on defensive. These regulations may be varied, but, played in this manner, six-man baseball is so fast that a full game can be completed during the ordinary school recreational period. Players have a turn at bat more frequently, and must be more accurate since they hit into a sixty-degree angle instead of ninety.

"Telescope" Looks Inside of Metal Pipe to Locate Flaws

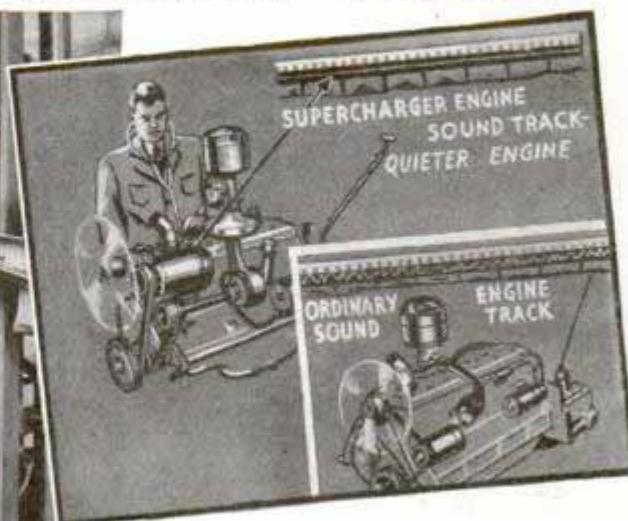
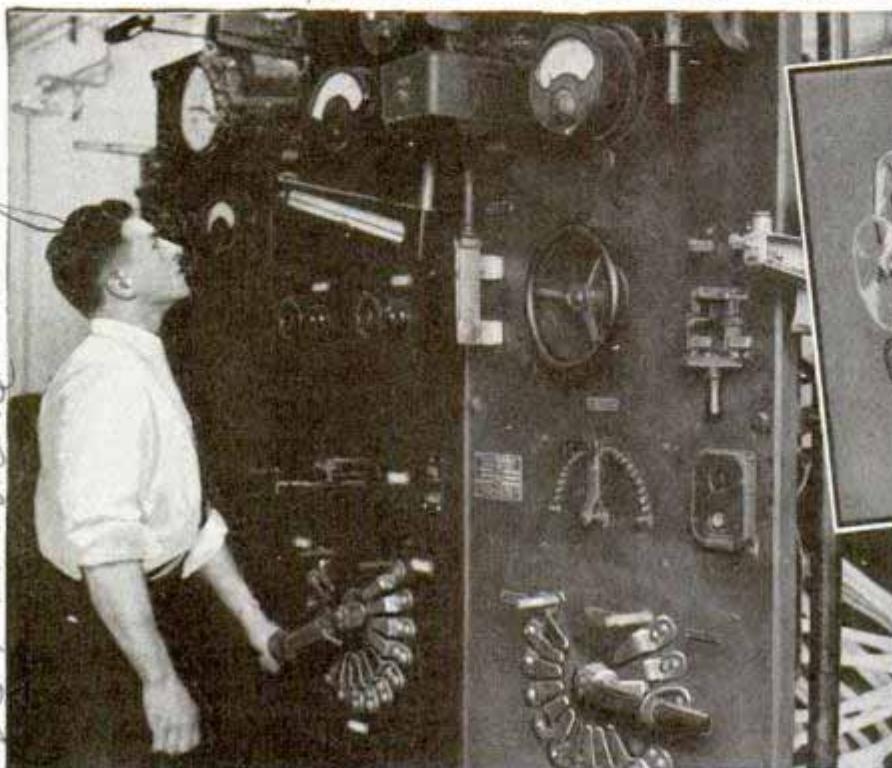
Inspection of the inside of newly manufactured metal pipes is accomplished with an instrument resembling a telescope. Through a series of special lenses and reflectors, and aided by a light, the adjustable eyepiece can be focused on any point in the entire 360 degrees of the pipe's interior surface. By magnifying defects, the instrument helps an inspector detect small cracks, slivers or pits, and their exact locations are determined by calibrations on a revolving barrel.



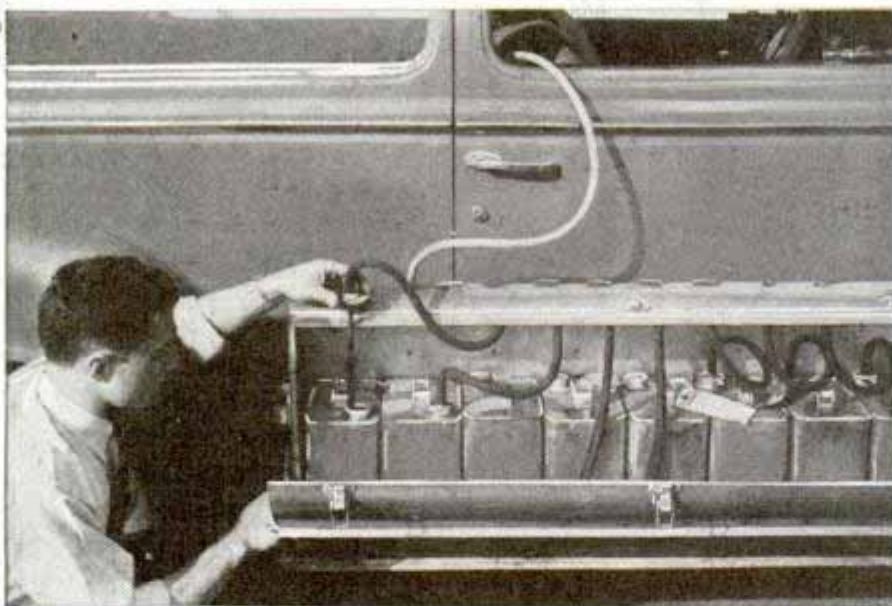
Looking for flaws inside metal pipe with illuminated "telescope" that magnifies tiny imperfections

0961. M. L. Sums Jr.
5555 Holman Ave.
Los Angeles, Calif.

The CHALLENGE



Engineer at panel of dynamometer (top, left) which shows results of engine test. Right, test reveals how supercharger smooths out engine performance. Below, installing fuel tanks on test car for road run



San Fernando Laboratory Cuts
PUT a supercharger on a race car and it goes faster than ever before. Take the superchargers off a long-range flying boat and it can no longer carry enough load to pay for its trip. Put a supercharger on your car or truck and you ought to get more power and economy.

In that case why aren't all cars equipped with superchargers? Automotive engineers reply: "Do you need more power than you already have or would you prefer a smaller, much more economical engine

turer has designed a supercharging unit for Fords. Graham-Paige broke the ice in the stock-car field by using as standard equipment a supercharger that rotates at up to 40,000 revolutions per minute and that forces the fuel-air mixture into the combustion chambers at five pounds per inch above atmospheric pressure. The supercharged engine develops additional horsepower and operates on a gas mixture so lean that it would not keep an ordinary engine running.

that performs as well as today's engines?

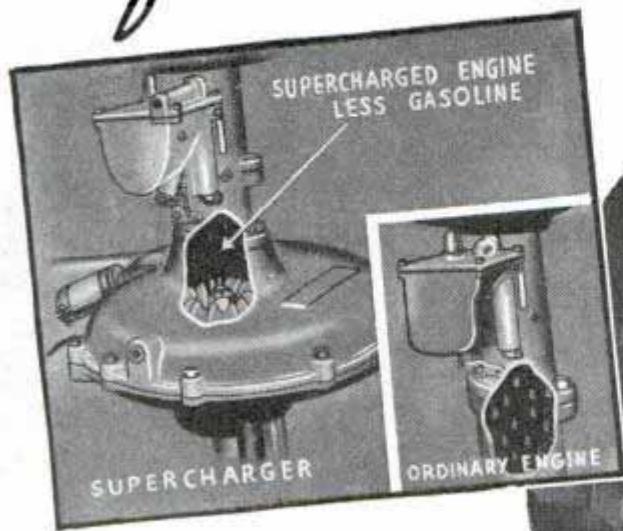
They visualize small supercharged power plants that will use much less fuel but that will give just as much speed and acceleration as the engines of today. Supercharging is expected to be the next important step toward greater engine efficiency but first the engineers have a number of problems to solve.

Superchargers are already in use on some truck and bus engines.

One accessory manufac-

McCulloch Engineers

of the SUPERCHARGER

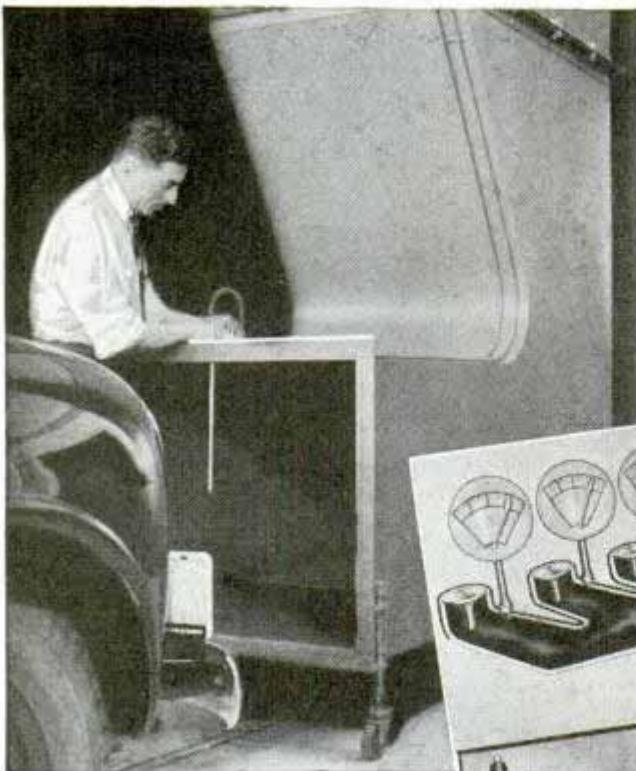


Every one has heard that only a small percentage of the total power in a gallon of gasoline is put to work in an ordinary engine. To some extent the amount of power extracted from the fuel depends on the degree to which the fuel charge is compressed in the cylinder, and one way of obtaining this effect is to force the fuel into the combustion chambers under pressure. Supercharging is a sort of

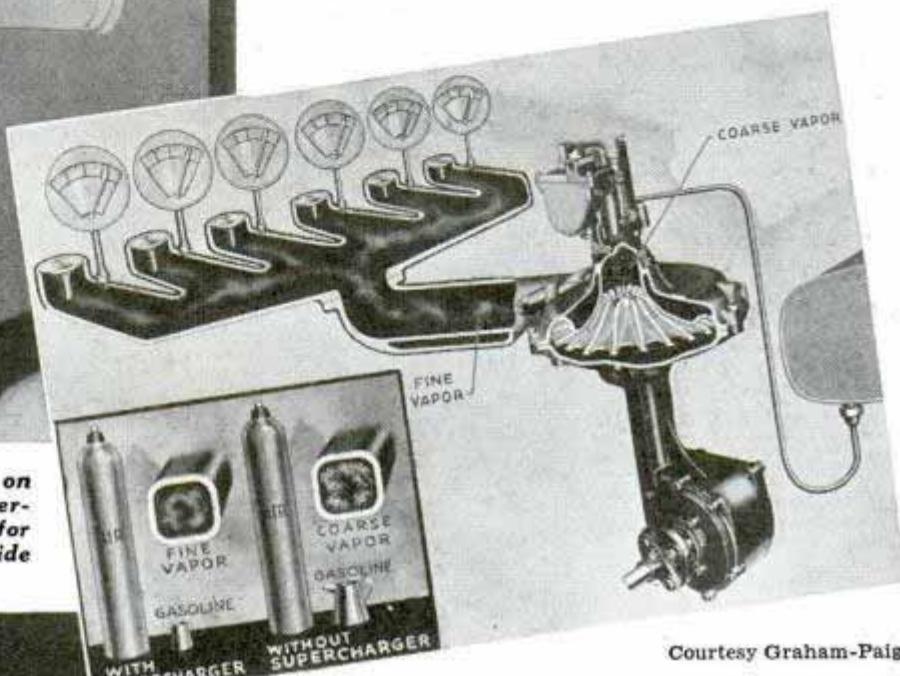


Top, left, showing why supercharged engine uses less fuel. Circle, attaching analyzer to car's exhaust pipe. Center, supercharger action results in better fuel mixture. Bottom, truck and trailers carrying 60,000-pound load on a test run





Top, wind tunnel in front of car on dynamometer test. Right, supercharger equalizes fuel mixture for all cylinders. Below, baffles inside wind tunnel direct air flow



Courtesy Graham-Paige



Courtesy Ethyl Gasoline Corp.

forced artificial respiration. It pumps a much heavier fuel and air charge into the combustion chambers than would be forced in by atmospheric pressure alone. The result is a more powerful thrust against the piston. In theory, supercharging is not economical but a number of factors make it possible to lean down the carburetor

mixture and gain considerable economy. One of these factors is the mixing and vaporizing action performed by the vanes of the supercharger. The raw gasoline and air are stirred into a much more homogeneous mixture than is done by the carburetor alone. Better atomization and more even distribution result.

One interesting development in preparing the fuel for ignition is a device that creates supersonic waves in the intake manifold. These silent sound waves aid in the atomization of the fuel by jarring the fuel particles apart and keeping them in suspension during their journey to the combustion chambers. The waves are above the audible range of hearing and are created by a small slotted bronze ball, inside a metal cage in the manifold, that floats free in the air and that spins at a terrific rate because of the blast action of the fuel charge being drawn past it. This "power ball" is claimed to produce better mileage and performance, cooler operation, and less carbon in several popular makes of cars.

Since the benefits of supercharging make it a logical step in automotive progress and because the right kind of fuels for such engines need study, the Ethyl Gasoline Corporation is conducting an intensive investigation of supercharging at its research laboratory in Detroit. A stock eight-cylinder engine is used in the tests, attached

(Continued to page 116A)

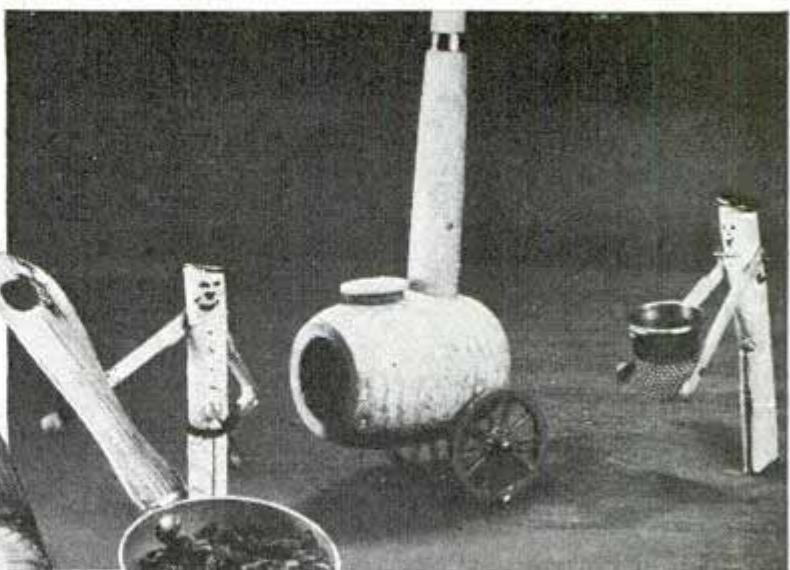
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B.C.

Off 28 w. Alameda
B.C.

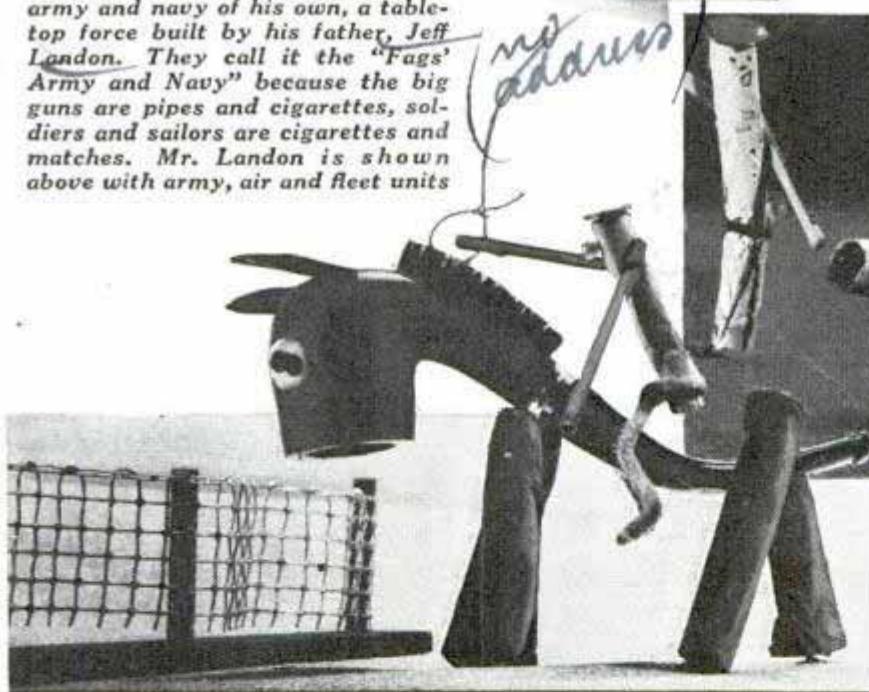
Pipes and Cigarettes Form a Tabletop Army



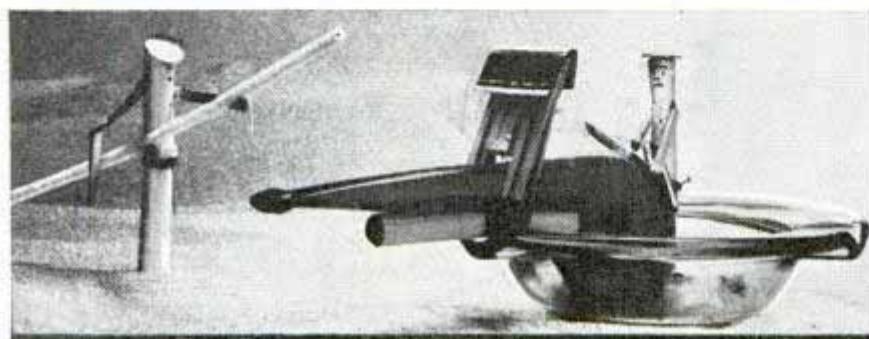
(no address)
Tommy Landon of Virginia has an army and navy of his own, a tabletop force built by his father, Jeff Landon. They call it the "Fags' Army and Navy" because the big guns are pipes and cigarettes, soldiers and sailors are cigarettes and matches. Mr. Landon is shown above with army, air and fleet units



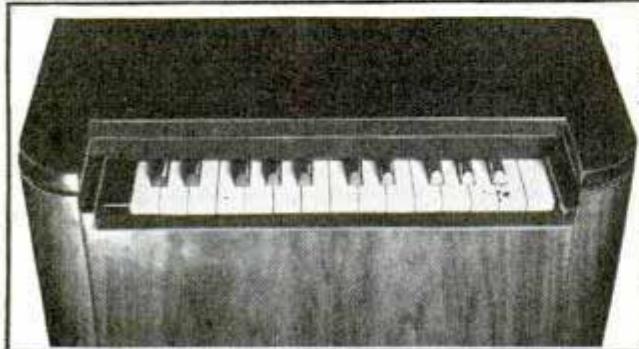
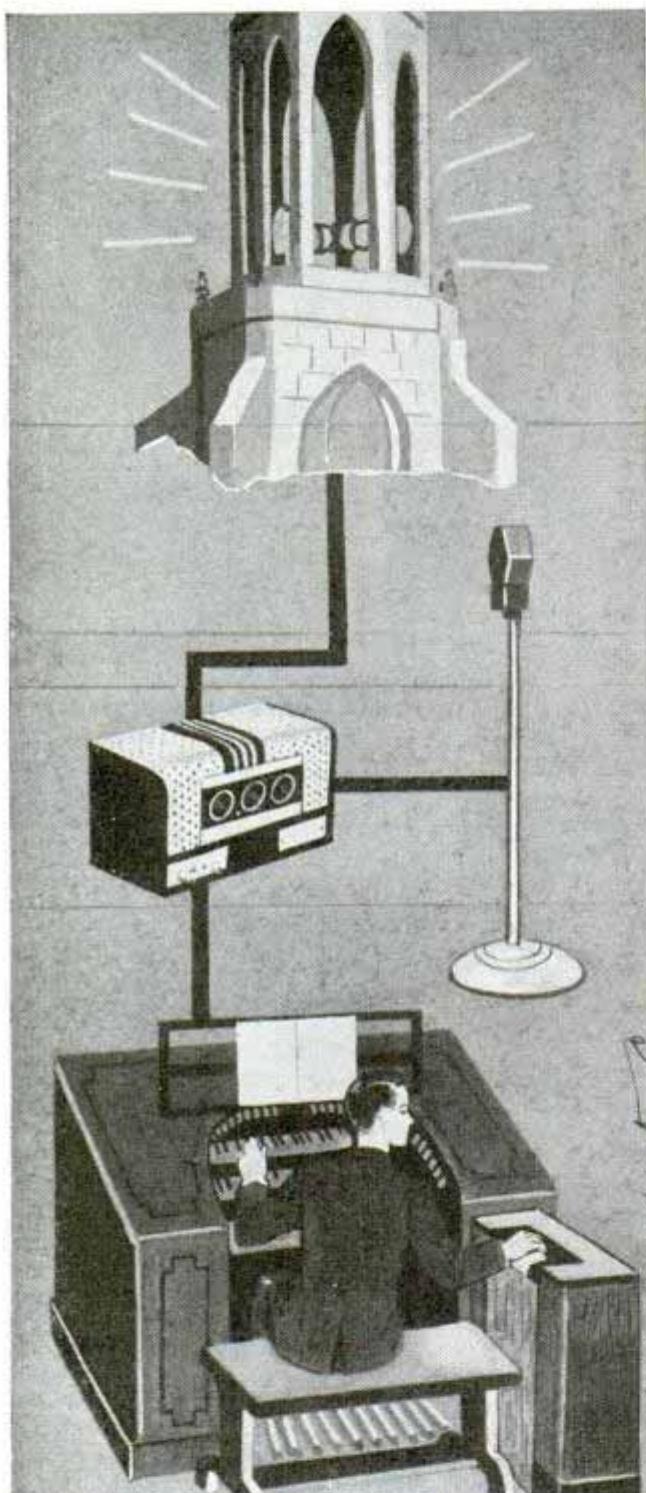
Even a toy army must eat, so the miniature field kitchen rolls up to camp with a mobile oven that you recognize as a corncob pipe on wheels. Cigarette soldiers with matches for arms ladle spinach out of an ashtray, and the troops step up to get their hearty thimbleful of rations at mess time



While a gunner in the "Fags' Army" at bottom, trains his combination pipe-and-cigarette cannon on the enemy, another artilleryman stands ready with a pipe cleaner to clean the muzzle before the next shot. Safety matches shield the gunner, and a glass ashtray serves as emplacement. A field artillery crew is seen above, the officer wearing a pin for a sword. At left, a cavalryman prepares to take his horse over a fence



Tiny Reeds Rival Giant Carillon's Bell Music



J 9/6.
How electric carillon is used with organ amplifier and public-address system. Below, view of keyboard

Bell notes that rival the tones of a carillon of twenty-six giant bells are produced by little hammers tapping slender metal reeds, the entire system being housed in a cabinet no larger than the ordinary home radio console. Operating a two-octave keyboard produces the music of dancing electrons induced in magnetic coils by the vibrating reeds, whence they are amplified in radio tubes and conducted to a loud-speaker. The electronic tones may be controlled in volume and their music aimed in any direction. Another instrument, a five-note Westminster chime, may be operated from a clock to peal at fifteen-minute intervals. Both systems, developed by RCA Manufacturing company, are designed for use in churches, schools and parks.

Camden NJ

Tool Loosens "Frozen" Nut with a Few Hammer Blows

J 9/6
Nuts that are "frozen" or are located where it is impossible to get leverage with a wrench, can be loosened easily with a few hammer blows on a starter now on the market. Made of tough forged, heat-treated and tempered vanadium steel, the starter has a projecting lug with broad face to form a solid foundation for a punch, being reversible for tightening nuts in hard-to-reach places. The set of fourteen starters fits all sizes of standard hexagonal nuts measuring from three-eighths to one and one-quarter inches on the flat. Each starter has twelve angled recesses, so it is shifted only a short distance from one recess to the next as hammering progresses.



J 10/44

Small Robot Weather Observer to Aid in Forecasts

Better weather forecasting with the aid of a ring of robot weather outposts in Alaska and northwestern Canada is in

Science Service 9/6 126

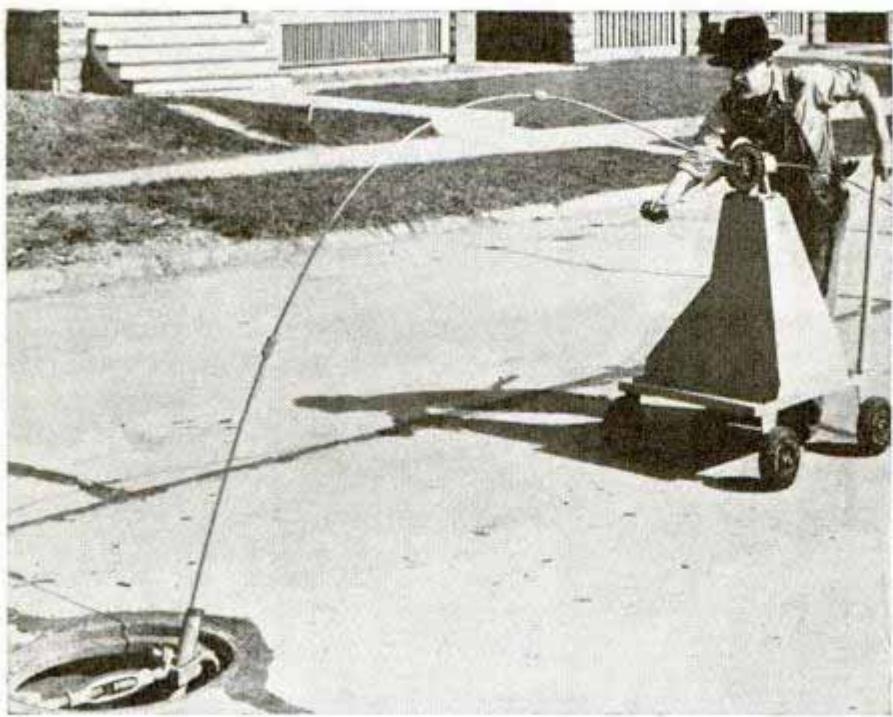
Skater Towed by Motorcycle in the Latest Sports Thriller



See World
Skijoring on skates, with motorcycles as the means of towing, is illustrated here. A special track makes the sport safer

Roller skatejoring is the latest sports thriller. The skaters wear special skates with rubber wheels. Towed by motorcycles, they attain speeds up to thirty-five miles per hour on smoothly surfaced tracks specially built for the purpose. The sport was inspired by skijoring.

Roots Are Cut from Deep Sewers by Spinning Steel Rod

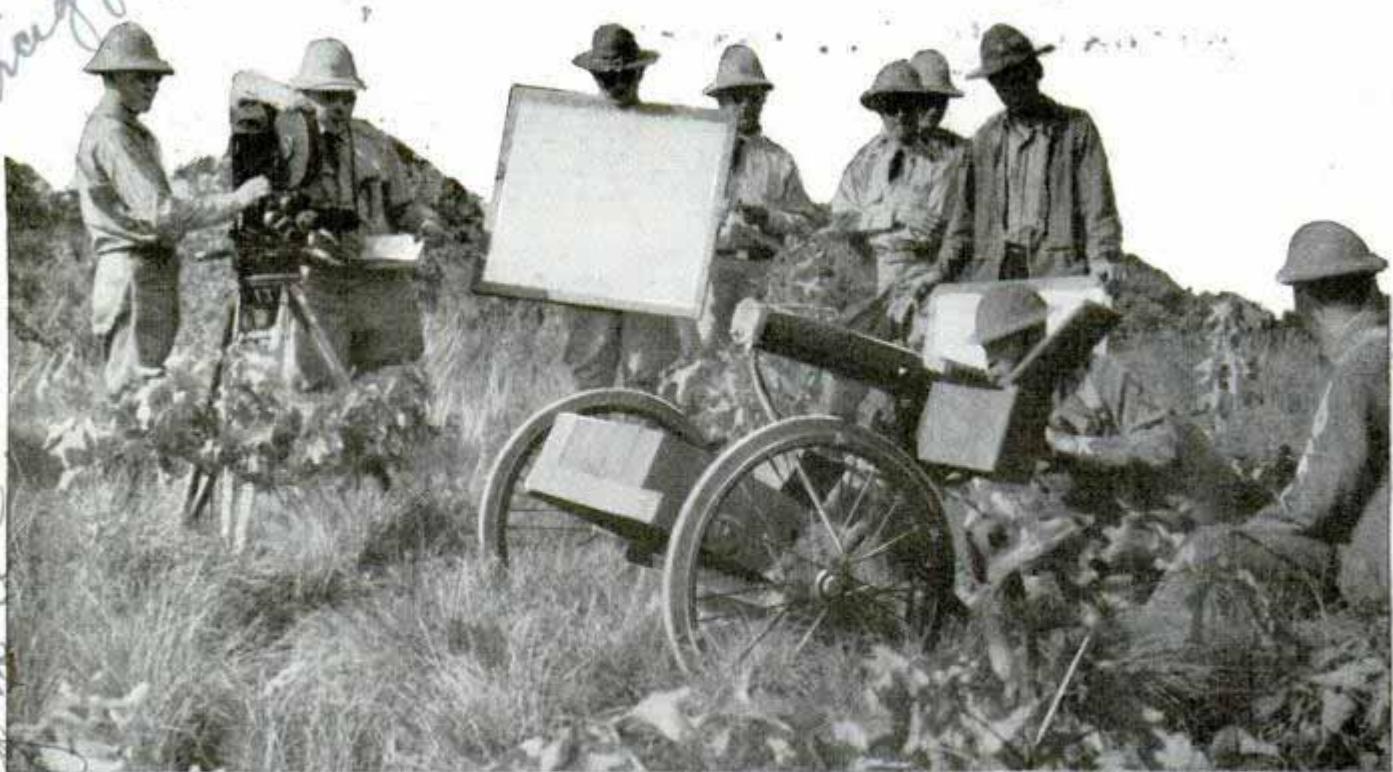


"Fishing rod" used by workman angling for tree roots which have crept into sewer. Sharp cutting tool turned by crank severs the growths

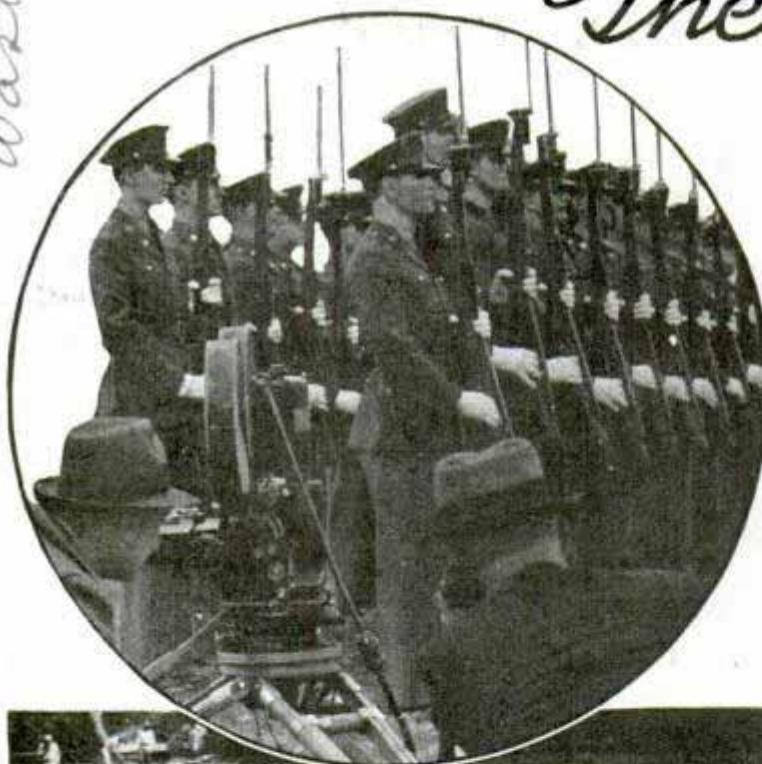
Little tree roots that creep through cracks into sewers often grow to large size and seriously obstruct the passage. To chop them off, a cutter mounted at the end of a long steel rod is lowered through the manhole and unreeled. The apparatus is carried on a rubber-tired cart.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

*2nd Inf. Regt. n.
Montgomery County, Pa.*



The MOVIES

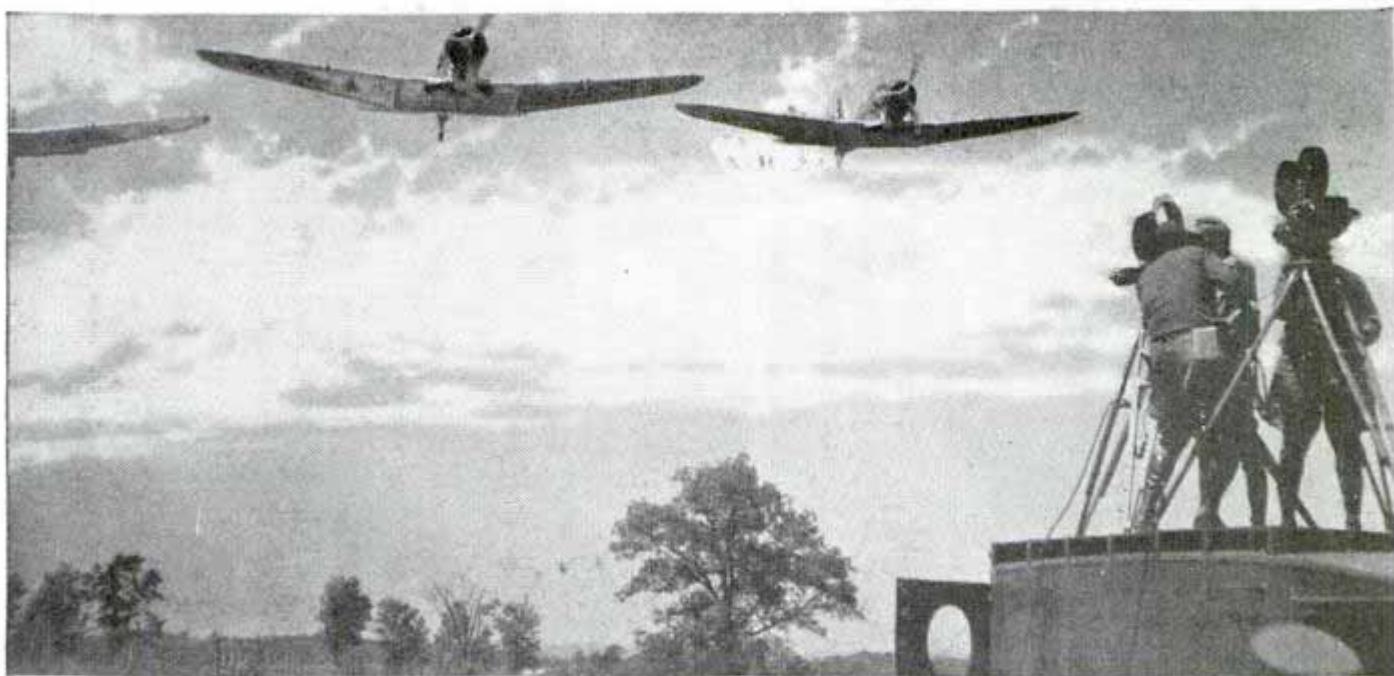


TO ITS bombs, airplanes, battleships, field artillery and other fighting equipment, America is about to add motion pictures. The Signal Corps of the U. S. Army plans, in substance, visual instruction of troops via the movie method. In addition to familiarizing rookies with the method of reading military maps it gives them a definite visualization of the objective they are working toward in any maneuvers programs in which they participate.

In other words the fledgling soldier who now learns elementary military movements under the personal supervision of a hard-boiled sergeant soon will be permitted to see those movements executed with machinelike precision on the screen to the accompaniment of staccato barks from commanding officers. Likewise budding artillerymen will be able to view batteries of artillery guns in action, the positions and tech-

Shooting scene showing how infantry defends itself with machine guns against low-flying planes (top). Filming military movements (center) and the building of bridge (bottom). Fledgling soldiers are shown films like this to aid in training

2969



JOIN *the* ARMY

niques of gun crews and other important details.

The Signal Corps, after almost twenty years of experimentation, is ready to do a complete job on this method of training soldier personnel, so that in case of emergency this country would have a complete program of thousands of training films ready for instructing in every depart-

(Continued to page 141A)

Top, scene like this is flashed on screen to show rookie pilot how to handle plane in formation. Circle, ready to film take-off at Wright Field. Bottom, proper bayonet procedure is taught young soldiers more easily by movie method



Exhaust Fan on Window Cools the Entire House



Fan mounted outside of window draws air from house fast enough to make complete change once a minute

If you live in a rented house unequipped with an attic ventilator, you can fit the place with an exhaust fan which involves no alteration to the house and remains completely portable. The fan is mounted outside a window, by supporting it on an outside structure or wall bracket. A canvas duct connects the fan with the window. When windows are opened and the fan turned on, enough air is drawn out of the house to make a complete change in every room per minute. The breeze created on the lawn has enough force to keep away mosquitoes and other flying pests.

9 10 3

Plants May Help Prospectors Find Elusive Minerals

Leaves and young twigs of deep-rooted plants have been found to contain evidence of the presence of mineral wealth. Substances in the ground, dissolved in soil

water, are taken up by the plant roots and concentrated in the leaves. Two Swedish scientists have reduced this plant material to ash and subjected it to examination under a carbon arc, breaking up the light with a spectrograph and recording it as lines on a photographic plate. An abundance of any given element in the ash is indicated by strong and pronounced lines characteristic of that element. The method should prove valuable in the search for metals like nickel and molybdenum. Having established presence of a mineral in the plant, geologists endeavor to trace to its source the water that brought the telltale traces of mineral elements to the trees.

1005 Sunshine "Canned" and Shipped for Release at Distant Spot

Sunshine, which had been absorbed by luminescent powder and "canned" by being frozen in liquid air has been transported by airplane 1,000 miles and released in one of science's most spectacular feats, the achievement involving the "canning" of Florida sunlight and its release in New York. It started with the exposure of a slender glass tube containing luminescent powder to sunshine for several hours. Then the tube was placed in a vacuum flask of liquid air and flown to New York. There the tube was dipped into a beaker of water, to hasten thawing out of the



Scientist holding glass tube of luminescent powder, in which sunshine may be trapped

"frozen" sunshine. Feebly the tube began to glow, then in a few moments it was giving off a brilliant illumination in a darkened hall as the solar energy was released after nearly twenty-four hours imprisonment. In absorbing light energy, scientists believe the luminescent powder undergoes a temporary change in physical structure. The theory is that the outermost orbits of electrons, which make up the molecules and atoms of the powder, are distorted or literally moved from one energy level to another when excited by impinging light, thus imprisoning some of the light. In that position the powder is frozen at some 300 degrees below zero in the liquid air. Warming the powder in water causes the electrons to return to normal position and give out the light energy they held.

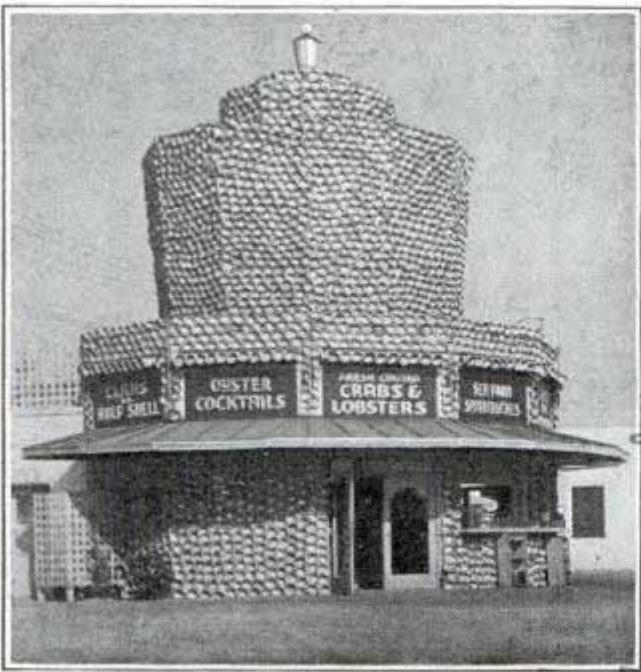
Small Air Tank Supplies Diver under Water Thirty Minutes



Two views of air tank which permits diver to remain under water for long periods. Left, ready to dive. Right, on bottom of pool

Sufficient air for twenty-five to thirty minutes is supplied by a small tank designed for underwater swimming. It is made of a compressed-air cylinder, some valves and part of an inner tube. The tank may be refilled at any auto service station. Air is admitted to the inner tube by a control wheel at the top of the cylinder. From the inner tube the air is taken into the mouth through a valve.

Restaurant Built of 10,000 Shells Advertises Sea Foods



Appropriate exterior for this sea-food cafe in Los Angeles consists of 10,000 abalone shells

Ten thousand sea shells form the walls of a Los Angeles restaurant which specializes in sea foods. Placed with the concave side out, the beautiful abalone shells make an attractive exterior and call attention to the sea-food menu.

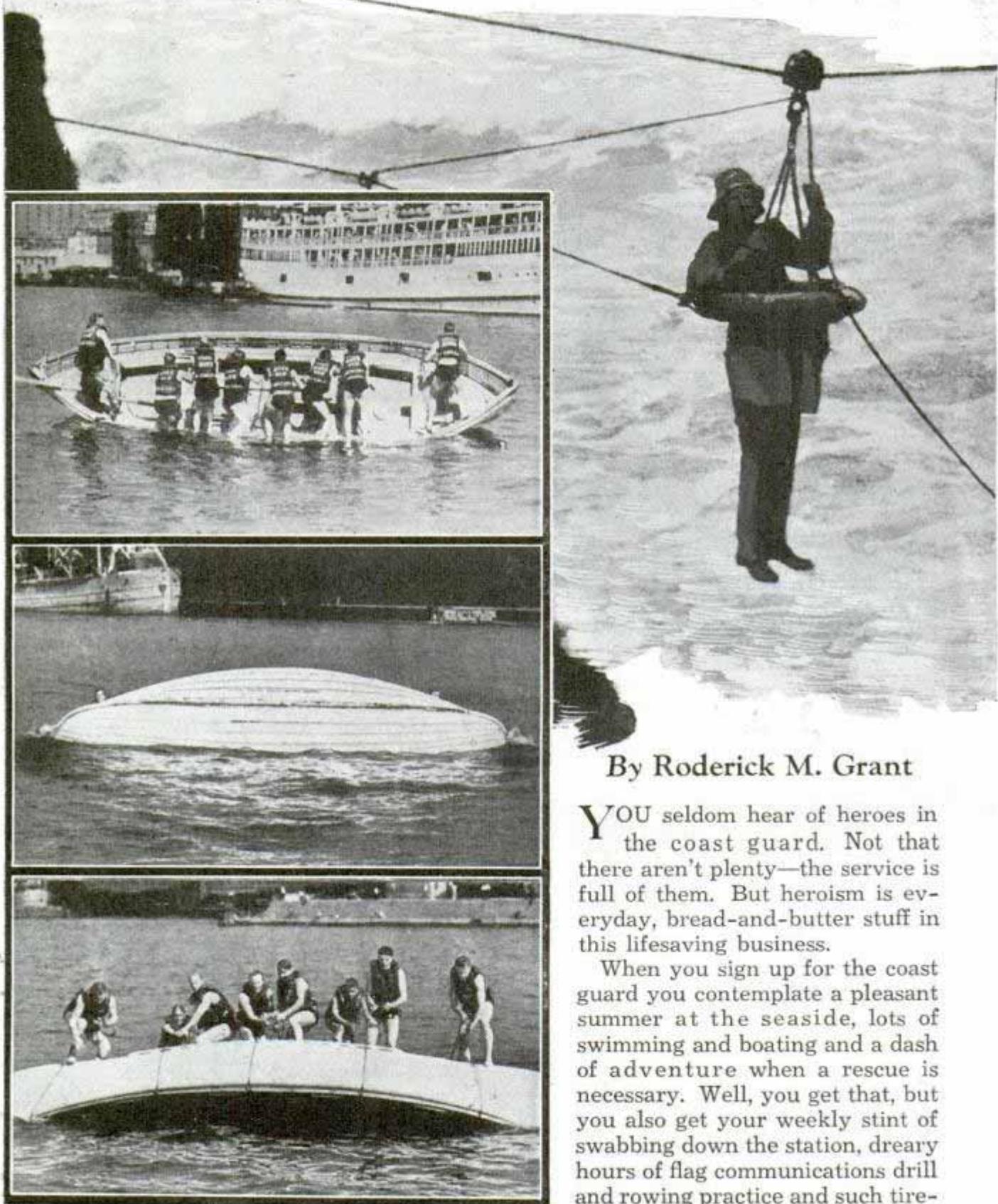
2/10/43

Spray for Reddening Apples to Speed Up Sales

Apples coming to market in the near future probably will be reddened by a new chemical spray. It will be a natural glow, not a makeup job. The natural red color of apples is due to a pigment known as idaein and the new chemical stimulates the formation of the pigment. It not only intensifies the color of naturally red apples, but induces a slight blush on yellow apples, thus making them more attractive.

The Sea Shell Abalone House

HEROES of



Coast guardsmen drilling on approved method of righting a boat after it has been upset (see strip at left). Right, the breeches buoy, with which the coast guard has effected many rescues. This method is especially useful in transferring men from a grounded ship to shore

By Roderick M. Grant

YOU seldom hear of heroes in the coast guard. Not that there aren't plenty—the service is full of them. But heroism is everyday, bread-and-butter stuff in this lifesaving business.

When you sign up for the coast guard you contemplate a pleasant summer at the seaside, lots of swimming and boating and a dash of adventure when a rescue is necessary. Well, you get that, but you also get your weekly stint of swabbing down the station, dreary hours of flag communications drill and rowing practice and such tiresome events as resuscitation and frostbite training—with maybe some frostbites of your own—and infantry drill.

the COAST GUARD

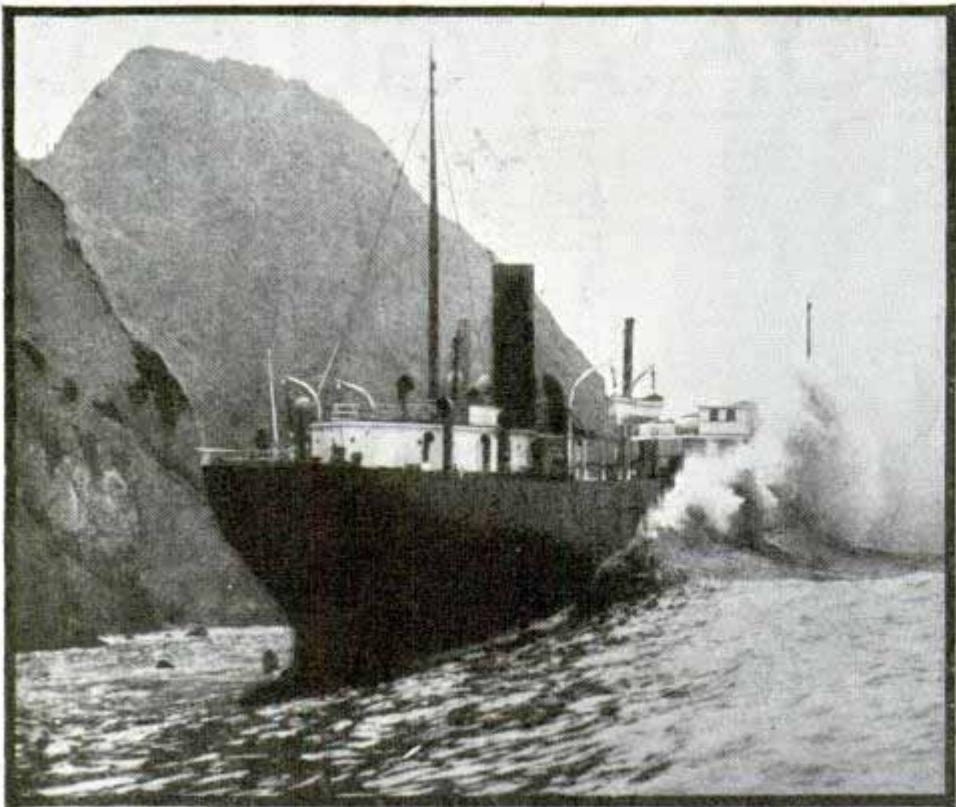


Thousands of lives are saved every year by coast guardsmen at the many stations that outline the lakes and seashores. Not one of those men would admit anything heroic about his work, least of all Chief Boatswain John O. Anderson, who has just gone ashore after thirty-nine years in the service. Most of that time he was chief of the "Old Chicago" station.

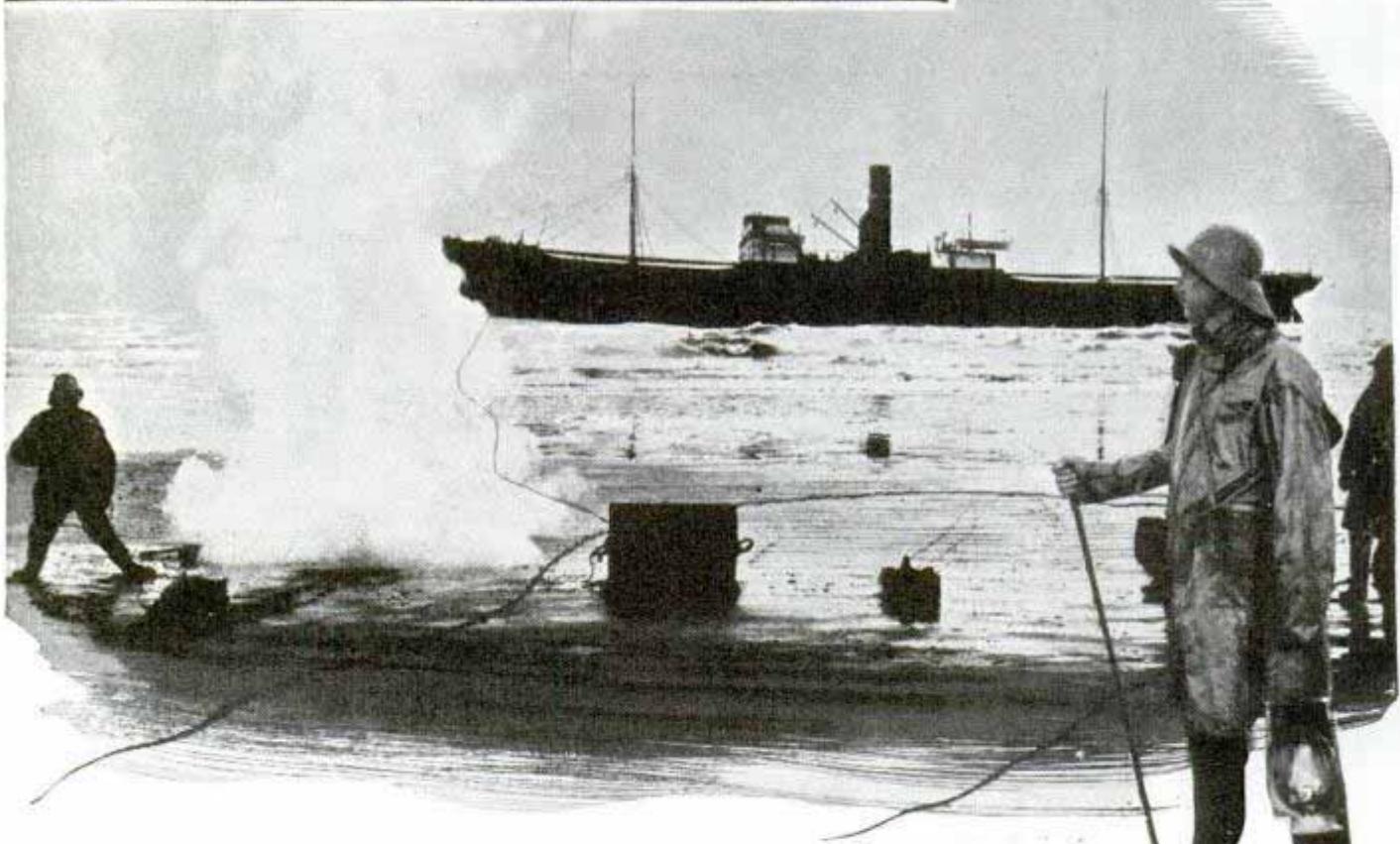
On the night that John Anderson became a hero a sixty-mile gale was blowing on Lake Superior. The mercury cringed at the eighteen-degree mark and spray froze on the nose of the little steamer "H. E. Runnels" as it poked its prow out of the harbor of Grand Marais, Mich., at 2:30 a.m. on an early November morning. Eight miles out the ship ran into a blinding blizzard. The cap-



Top, coast guard rescue boat returning from search for fishermen lost in ice fields on Great Lakes. Bottom, breeches buoy drill, with the guardsmen hoisting shore props to tighten the line

J 782
start again

Steamship "Coos Bay" stranded off California coast (top). Crew of thirty-five was rescued by means of breeches buoy and lifeboats. Center, shooting a line to stranded ship. Right, bottom, coast guard beach patrolman



tain wheeled around to regain the safety of the harbor and wait out the storm. Feeling her way in the blackness the "Runnels" missed the harbor entrance, then backed five miles out into the lake and tried again. As she fought toward port a second time the steering gear gave way, and with an emergency gear rigged up of block and tackle for hand steering, the ship plowed shoreward, once more missed the entrance and went hard aground a half mile off shore.

Coast guards had sighted the steamer a half hour before she struck. The chief of the Grand Marais station was absent on leave but luck had

brought to port that day Keeper John Anderson, on leave from the Chicago station. Anderson took command of the rescue. The beach gun was set up, and one well-aimed shot sent a whip line over the bowsprit of the "Runnels." The sailors made it fast, and the guardsmen prepared to send the breeches buoy out—but water swiftly froze on the pulley and fouled it. Rescue by breeches buoy was abandoned.

No one but a coast guardsman would have ventured into the surf that was pounding the beach, but there were seventeen men out there waiting for help. Lashing the forward end of the boat to the line stretching to the wreck, Anderson and his crew shoved the surfboat into the twenty-foot waves. Halfway out the lashing gave way, and the men tried the oars. Blades were as useless as matches in this blow. They made fast to the line again, bow and stern, and slowly hauled themselves by hand to the steamer. One by one, four men slid down the line into the surfboat.

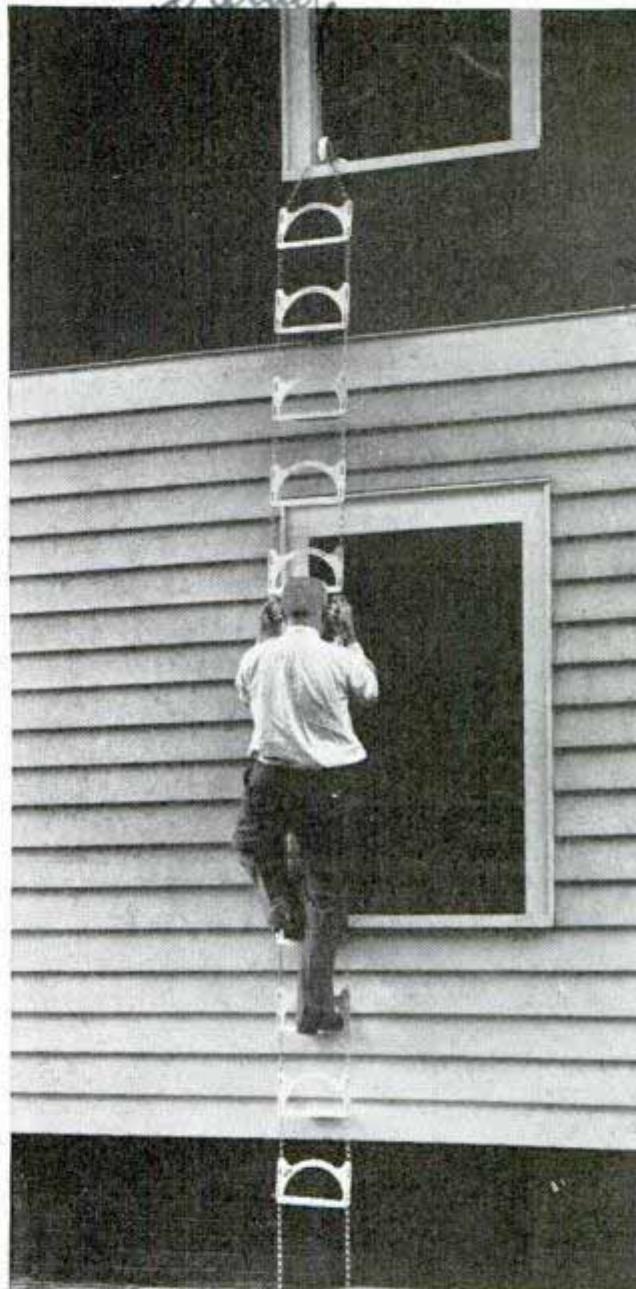
Turning their backs on the biting gale the guardsmen pulled for the beach. Suddenly a towering wave swept over the small boat, washed overboard every man. Fortunately all wore life belts, and all managed to make shore. But three of the crew were through for that day. Wrapped in blankets, they were cared for at the station while the rescue went on.

Back to the wreck went Anderson and crew three more times, bringing six men ashore, then five, finally shoving off for the last trip to rescue the master and chief engineer of the "Runnels." By now only Anderson and Mate Christoffson of the Grand Marais post were fit for the final trip, and four fishermen volunteered to help. They took off the captain, then it was the chief engineer's turn. He was a big hulk of a seaman weighing 315 pounds. Twice Anderson was swept overboard in trying to rescue him, and it was ten long minutes before he pulled the big fellow aboard with a boathook—ten minutes of paralyzing struggle in and out of a plunging lifeboat that might at any minute capsize or crash against the steamer.

Just as the surfboat rode a breaker high up on the beach and spilled out eight exhausted men, almost solid blocks of ice, a tremendous wave split the "Runnels"

(Continued to page 118A)

Portable Metal Fire Escape Anchors to Any Window



Climbing down from second-story window on metal fire escape that is anchored quickly to any sill

In case of fire or other emergency a folding metal ladder will convert any window into a point for escape to safety. An anchor at the top holds it to the window sill, and its load capacity is 1,800 pounds. Strung on a chain in the fashion of a rope ladder, metal treads four by nine and one-half inches assure a positive level footing. A sixteen-foot ladder is available for two-story buildings, and there is a twenty-four-foot one for three stories.

[An Arizona copper mine has been air conditioned to a depth of 4,000 feet.]

Magna Copper Mine

Sprayer with Three Nozzles Is Carried on Back



© British Press Combine
Chemical in tank carried on gardener's back is forced out through nozzles in pipe near ground

Used in England
Weed-killing chemicals are spread over lawns evenly by a hand-operated apparatus consisting of a long pipe equipped with three nozzles that extend close to the ground. A supply of poison is carried in the tank on the gardener's back.

Three Face Shields in One Unit Are Interchangeable

Three different types of industrial face shields, each for a special type of work, are interchangeable in one unit which is now

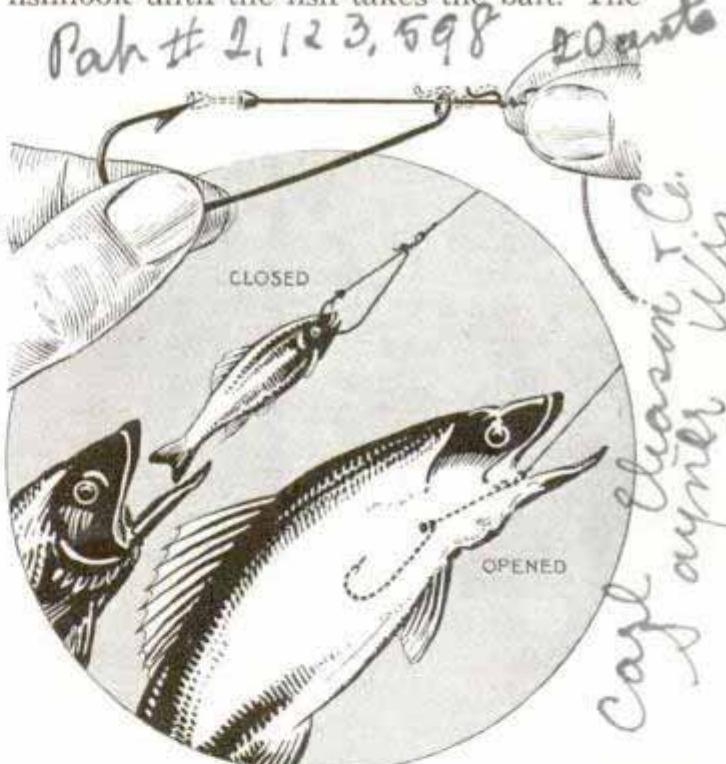


Three face shields to suit different types of work are interchanged on a single headband for workman

on the market. A screen is used for babbitting and protection from heat, while a clear Plastacele window is sufficient for spot, flash and gun welding, buffing, polishing, wire brushing and similar operations. These two guards afford all-around vision. To have complete protection for acetylene welding, burning and scarffing, the workman uses a fiber mask with a built-in window. Any of these shields can be buttoned on the headband quickly. Absorbent leather sweatbands, with wool-felt backing, keep perspiration out of the eyes.

Fishhook with a Safety Catch Is Set by Jerking Line

To prevent snagging on logs and weeds a Wisconsin man has invented a sliding safety catch that guards the point of the fishhook until the fish takes the bait. The



Drawings show how the guard over point of fishhook is withdrawn by jerk after fish swallows bait

tiny funnel-shaped guard rests over the point. When the fisherman feels a tug on the line and is ready to "set" the hook a simple jerk releases the guard and the fishhook opens and makes the catch.

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The CRAFTSMAN

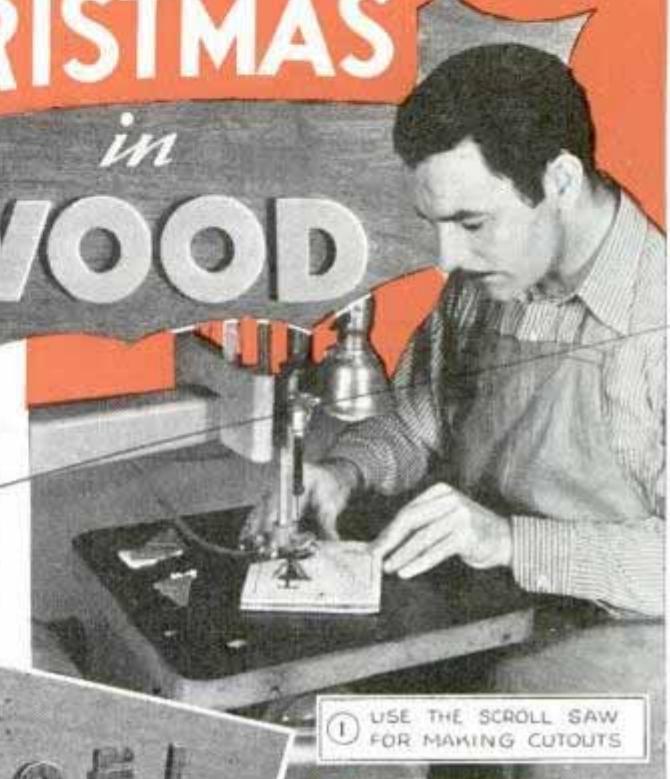
Craftsmen Wood Service
272 Henry

Say MERRY CHRISTMAS in WOOD

Thin veneer in rare stock lends itself to overlays, cutouts, or it can be carved

YOUR Christmas cards will be different and outstanding from the general run of paper cards if you use thin veneer in imported woods available at craftsmen's supply houses. The cost of veneer for this purpose is not high—probably not any more than you would normally spend for a good grade of paper cards. The fact that they are made entirely in your hobby shop adds to their personal character.

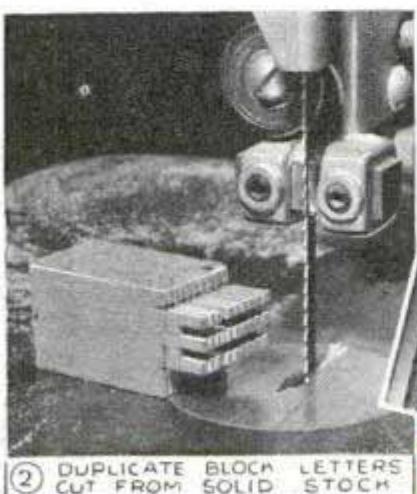
If you have a scroll saw, it's an easy matter to stack a number of pieces of veneer in a pad and make the same cutout on all the pieces as in Fig. 1. The design is traced on the top one. After cutting out the pieces,



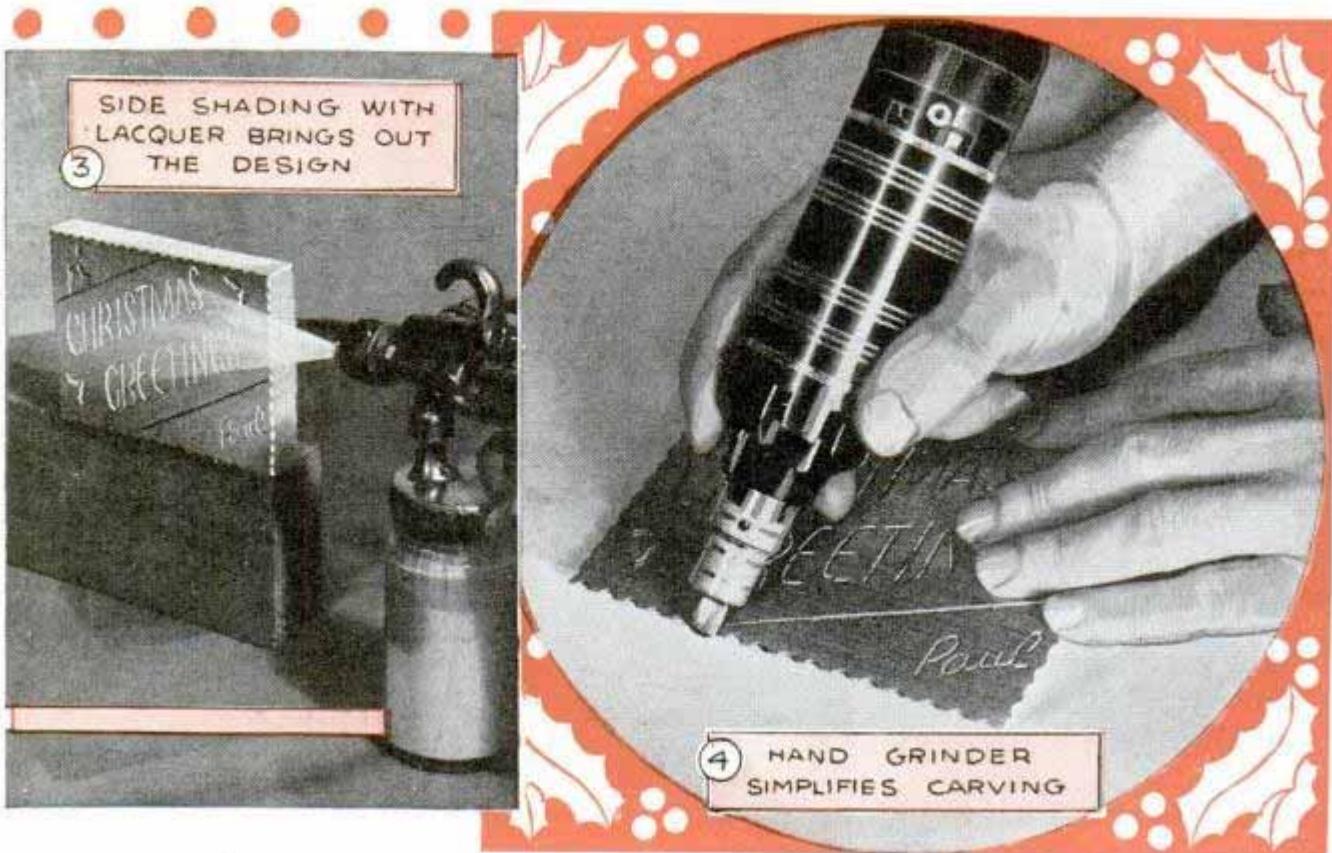
(1) USE THE SCROLL SAW FOR MAKING CUTOUTS



they are glued to a solid backing of contrasting veneer. Or, you can saw out letters for words to be glued to veneer cards. A number of duplicate letters can be cut out from solid stock either on a scroll or band saw. See Fig. 2. When cutting duplicate pieces in this way, the stock is held together securely by means of pins driven through the stock, preferably in the waste portion, or the pieces are rubber-cemented together. The latter method permits you to pull the



(2) DUPLICATE BLOCK LETTERS CUT FROM SOLID STOCK



sawed pieces apart easily, after which the cement is rubbed off.

A third type of card is one on which the wording is carved. Of course, each card is done separately and the whole job will take more time than the production methods already suggested. If you have a motorized hand grinder, light carving of letters does not involve much more work or

skill than writing, as you can see from Fig. 4. On carved work, beautiful effects can be obtained by means of side shading, Fig. 3, with a small paint-spray gun.

Besides the few suggestions given, these methods of making Christmas cards offer unlimited possibilities in obtaining varied effects, dependent entirely on the ingenuity and skill of the designer.

Inexpensive Buffing and Polishing Wheels Made of Paper

If a buffing or polishing wheel is not available all you need to make one is a couple of old pulp magazines. Remove the covers and draw a circle of the desired size on an outside sheet. Use tin shears to rough out the wheel, cutting fairly close to the line. Then clamp it between a couple of boards and drill the shaft hole. Put the assembly on the shaft, using mucilage between the sheets near the core to keep them together. Then start the motor and turn the circle to size with a chisel. For a permanent wheel, put the sheets on a hollow metal mandrel that will slip over the buffer shaft. Thread the outer surface for nuts to clamp the paper in place.

C You can slice fresh bread easily with a sharp knife that has been heated.

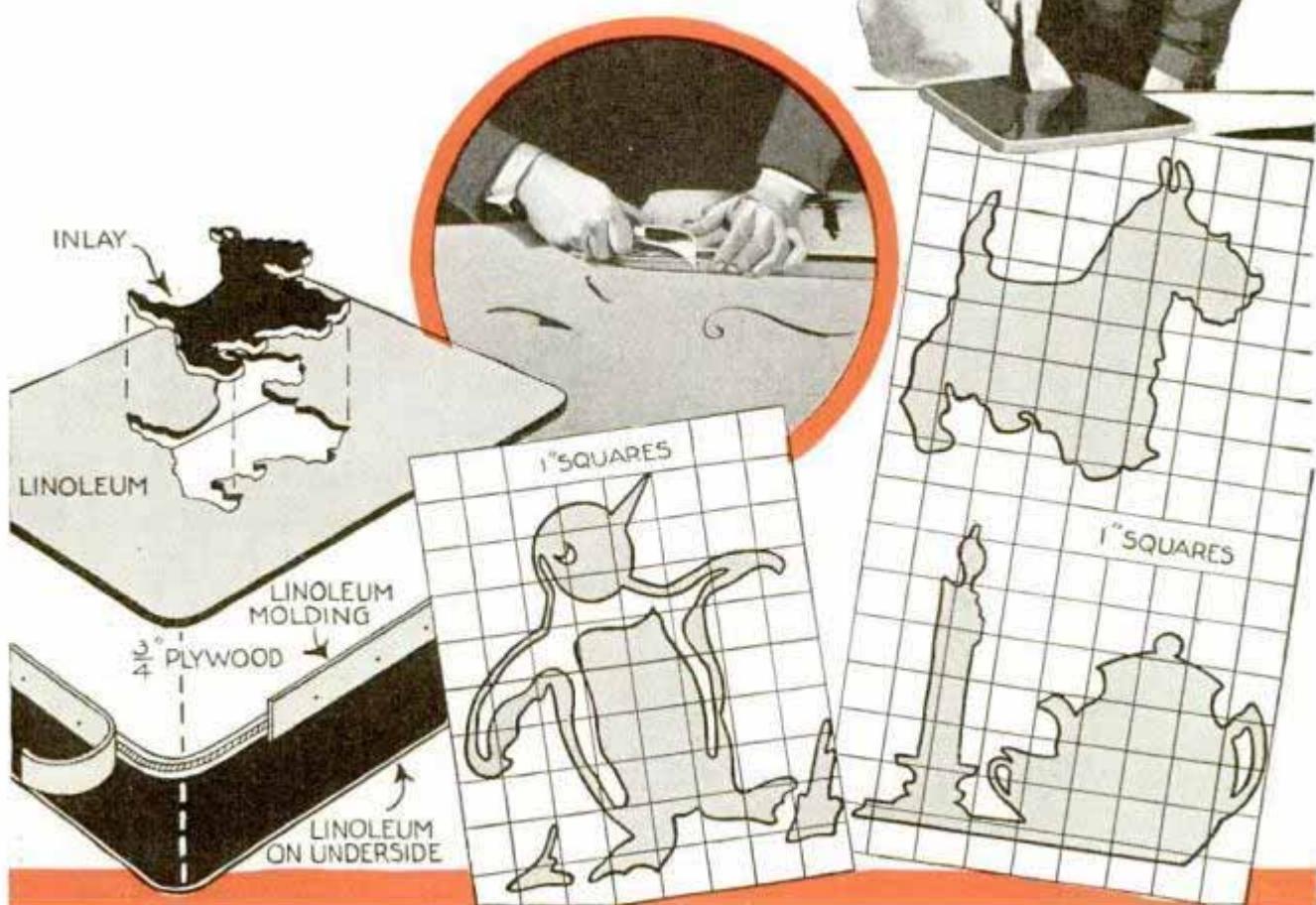


LINOLEUM INLAYS

make attractive breadboards



Colorful breadboards of linoleum with contrasting linoleum inlays are useful and decorative additions to modern kitchens. They are easy to make and various colors of linoleum available permit unlimited combinations. Besides the inlay designs given here, you can find any number of suggestions for inlays from the pages of catalogues and magazines, or you can purchase suitable inlays from stores that sell linoleum. The boards consist of plywood with linoleum cemented to both sides, the edges of the boards being bound with linoleum strips cemented and bradded in place.



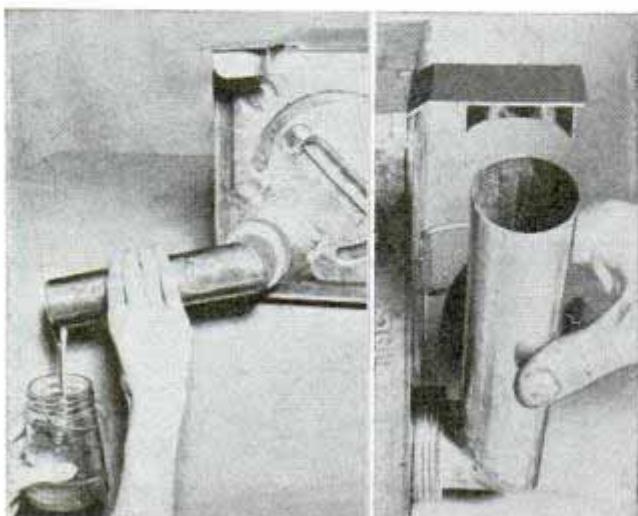
Sandpaper Clip Helps to Hold Balsa Wood While Cutting



Difficulty of holding thin strips of balsa wood on a board or table for cutting along pattern lines, led one man to devise a simple vise for the purpose. This consists of a folded piece of sandpaper, which is attached to the board with thumbtacks. The balsa is slipped between the abrasive surfaces, and the pressure of a finger holds it firmly while the blade is being operated to do the cutting.

Swing Spout Dispenses Liquids in Large Cans

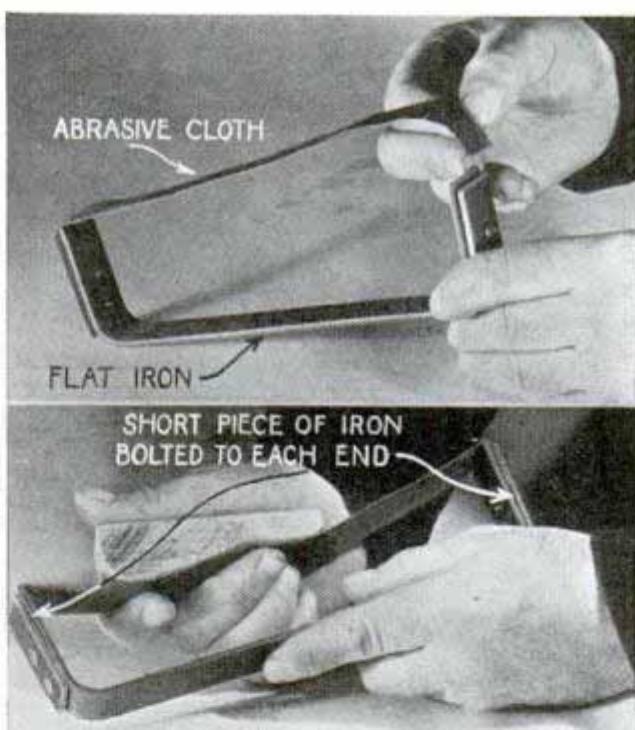
When filling small containers from large cans of honey, molasses, heavy oils or other thick liquids, lifting may be avoided by attaching a swinging spout to the screw



cap of the large can and placing the can on a flat surface. A hole should be cut in the top of the screw cap and a tin spout, 2 in. in diameter, soldered over the hole so that when the spout is in an upright position the lid will be screwed on tightly. A cap, to keep out dust, or other foreign matter, is slipped into a raised strip soldered to the side of the can. To fill a container the spout is lowered until the liquid runs out.—Benj. Nielsen, Aurora, Nebr.

Sanding Bow for Curved Work

A bow to take a strip of abrasive cloth will facilitate sanding irregular-shaped work. The bow consists of a length of thin flat iron bent to a wide U-shape, with short pieces of iron bolted to each end to clamp the ends of the abrasive cloth. In use, the cloth is held against the object to be sand-



ed and it is pressed into the low spots with the fingers, as shown in the lower photo. Sanding is accomplished, of course, by pulling the bow back and forth. If desired, a wood handle can be attached to the bow with small bolts.

—Merle Terrill, Portland, Ore.

Before washing porcelain tubs and sinks, wipe them with a cloth dampened with kerosene, which will cut the dirt and grease and reduce the amount of scouring necessary to clean them.



Plywood KITCHENWARE

IT'S just like pouring coffee to dispense soap chips and beads from these containers. The one with a spout is for soap beads, while the other with a pivoted lid, which is opened like an old-time syrup pitcher, has a larger opening for chips. Both containers are made of $\frac{1}{4}$ -in. plywood, and are assembled with small brads. The holder for salt and pepper shakers at the bottom of the page has a teapot motif to carry out the kitchenware idea.



Stains Applied to Wood Turning with Shoe-Polish Dauber

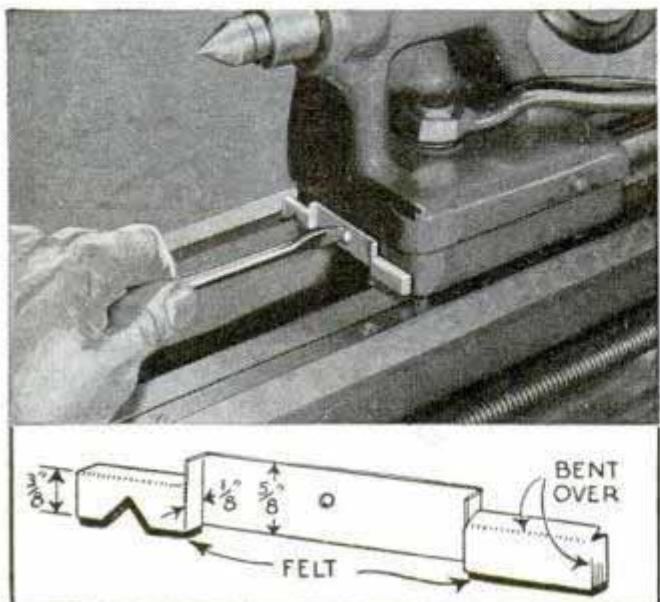


A shoe-polish bottle fitted with a dauber provides a handy receptacle for wood stains. I find the bottle more convenient than the original stain can, as the applicator is always at hand and there is no loss of time in cleaning or caring for a brush.

—G. E. Hendrickson, Argyle, Wis.

Wiper Cleans Ways on Lathe

After having a chip of tool steel work under the tailstock of my home-workshop lathe and scratch the way, I added a wiper



to the tailstock to avoid such damage. The detail gives the dimensions, some of which are omitted because these vary with the size and type of lathe. A hole is drilled in the center of the wiper, and the tailstock base is drilled and tapped to receive a clamp screw. This permits the wiper to be removed by loosening this one screw.

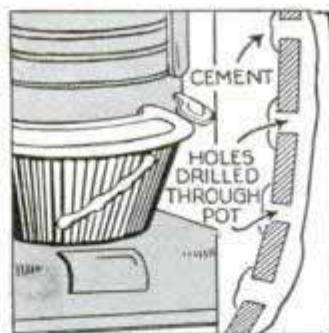
—Burl Knutson, Bismarck, N. D.

Slotted Washer Opens Tubes of Ink or Paint

Printers and painters who use inks or paints in collapsible tubes will find a slotted washer handy for removing the screw caps. After slotting the washer, bevel the severed ends to sharp edges so they will tend to bite into the cap when pressed over it.



Repairing Crack in Stove



Cleaning a crack in a stove fire pot so cement will bond to it to form a good repair is simplified by drilling holes through the pot at the crack as indicated. Bright metal is exposed inside the holes so the cement makes a good bond. Holes at each end of the crack tend to prevent further damage.

Clothespin Holds Paint Paddle

To keep a paint paddle in the pail from interfering with the brush, a painter uses a clothespin clip as shown. One side of the bail is removed and inserted through the pin so that it rests horizontally on the edge of the pail.



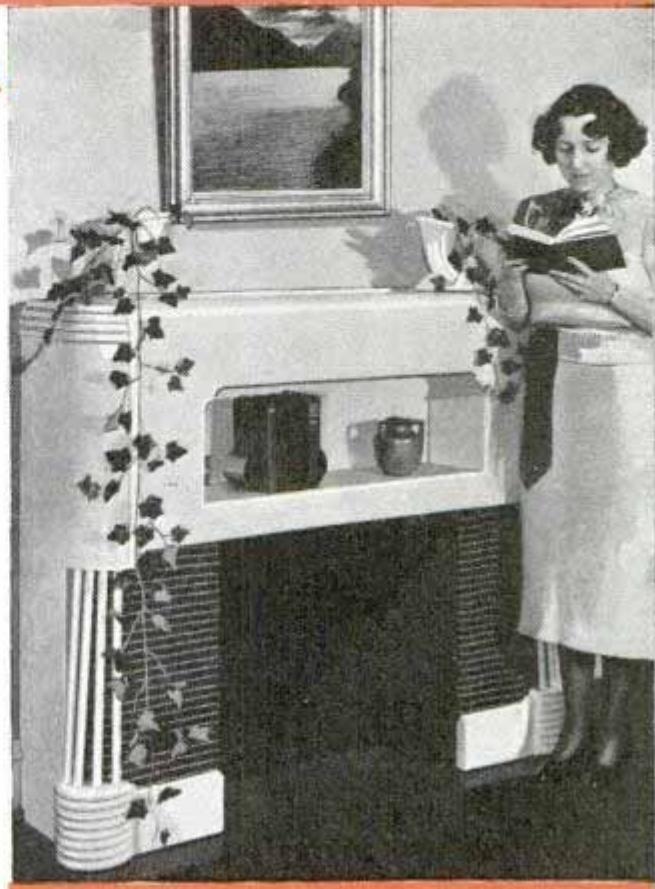
FRIENDLY HEARTH

fits new living rooms

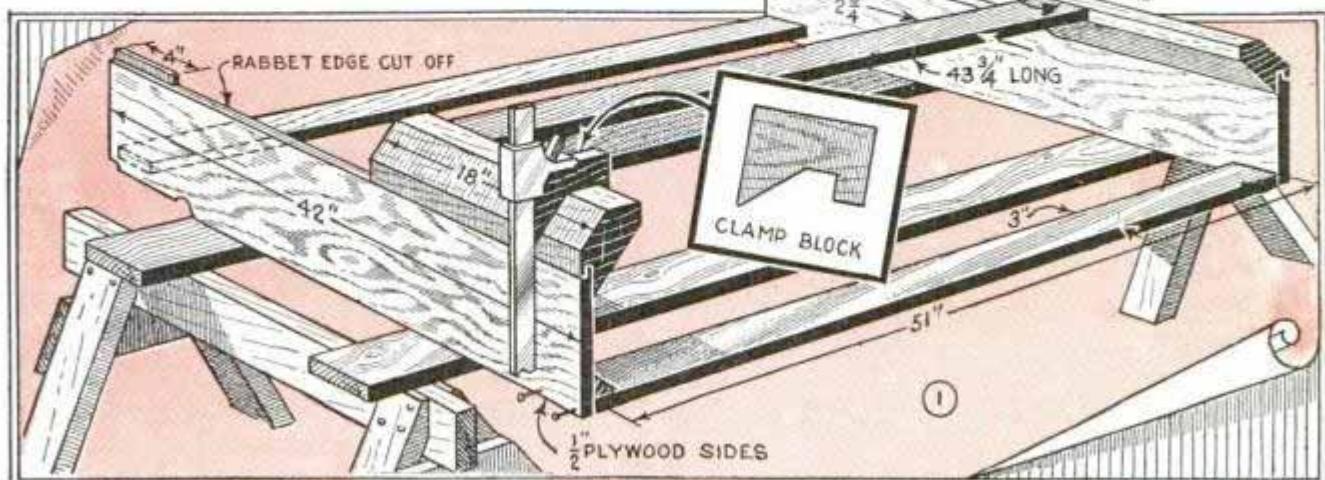
Portable fireplace in bone white has recessed shelf for books and bric-a-brac, and can be moved to any wall space for varied effects

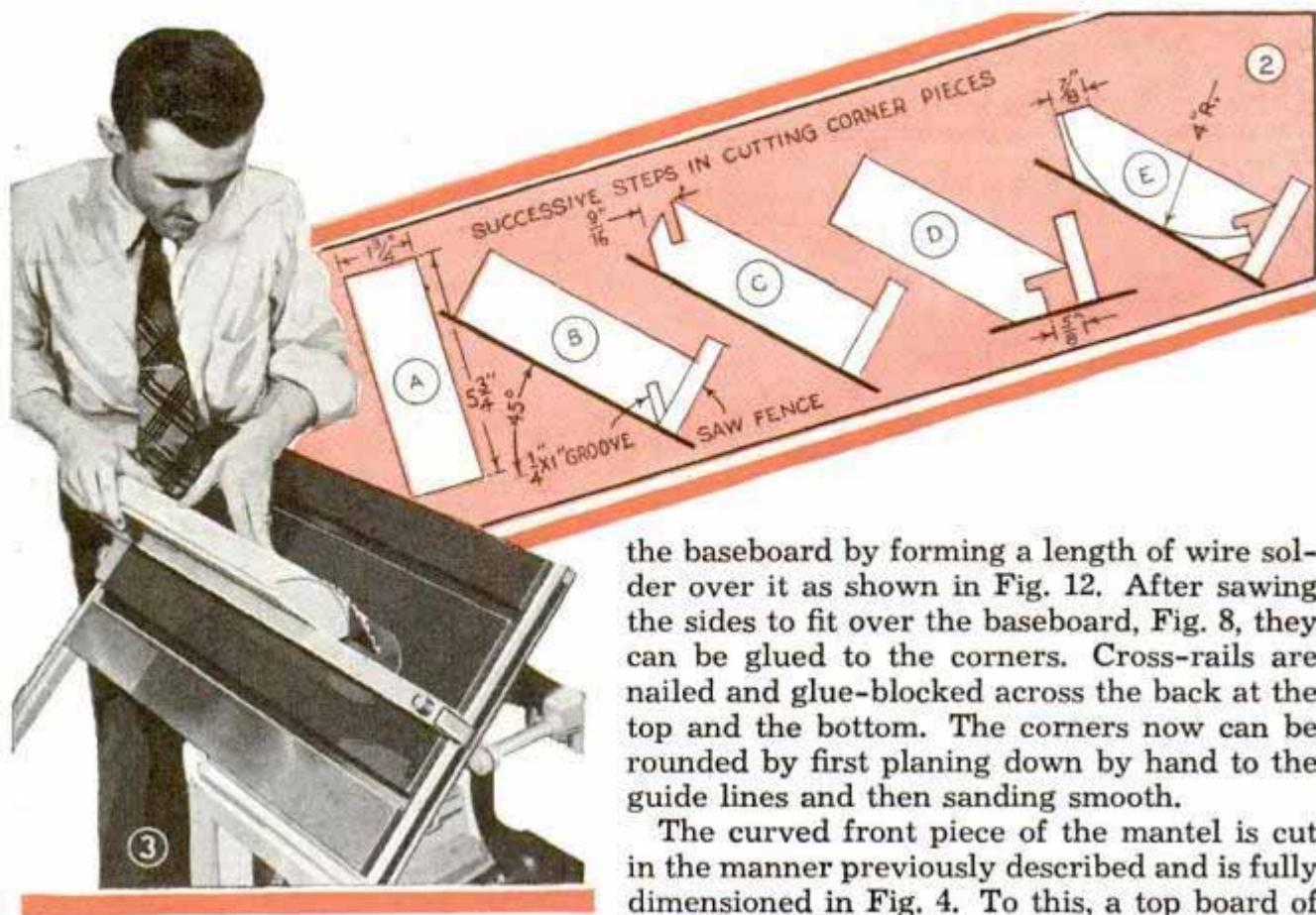
By WAYNE C. LECKEY

DESIGNED to harmonize with the furnishings of most rooms, this fireplace and mantel combination provides space for a radio, books and decorative knickknacks in the small home or apartment. It's easily moved when you want to rearrange the furnishings. Soft wood, such as white pine used together with fir plywood is suitable for constructing the fireplace as the finish is to be enamel. Referring to Fig. 1, shape two blocks which make up the corners of the frame. This is done on a circular saw with the table tilted to 45° as in Fig. 3. Fig. 2 gives the successive steps. A compass set to a 4-in. radius is used to scribe a guide line on each end of the pieces, although planing the pieces round is not done until after they have been glued in place. The two corner pieces are now joined with a cross-rail doweled and glued 2 in. up from the lower end. A couple of clamping blocks to hook over the corners will enable you to draw the joints up squarely with a bar clamp. While the glue



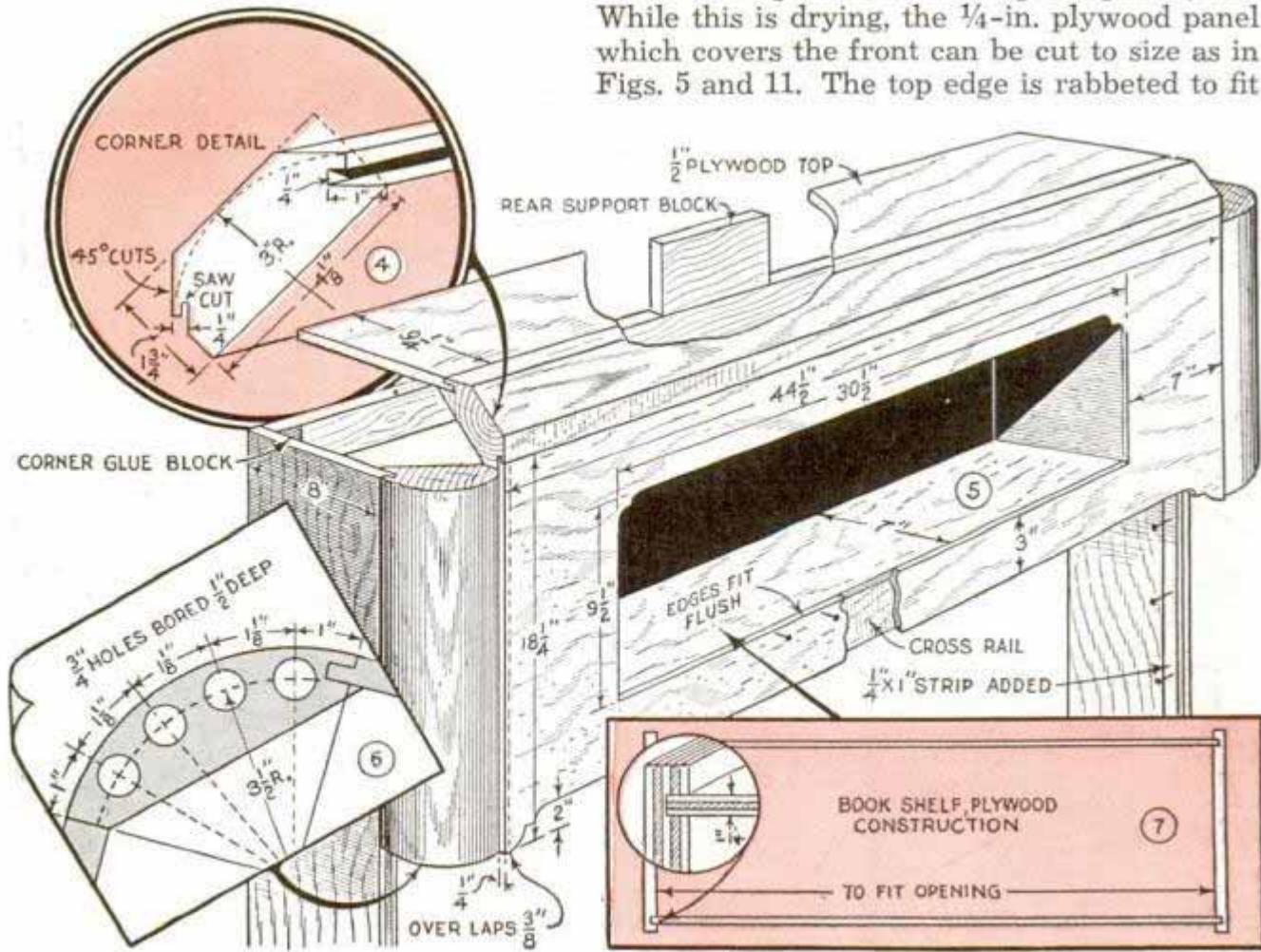
is drying, the plywood sides of the frame can be cut. One edge is rabbeted to fit snugly in the corresponding groove in the corner piece, Fig. 1. Here, as before, each side must be cut as a right or left-hand member. A portion of the rabbeted edge is removed flush with the shoulder and sanded smooth. If the fireplace is to fit closely against the wall, make a pattern of





the baseboard by forming a length of wire solder over it as shown in Fig. 12. After sawing the sides to fit over the baseboard, Fig. 8, they can be glued to the corners. Cross-rails are nailed and glue-blocked across the back at the top and the bottom. The corners now can be rounded by first planing down by hand to the guide lines and then sanding smooth.

The curved front piece of the mantel is cut in the manner previously described and is fully dimensioned in Fig. 4. To this, a top board of plywood is rabbeted and glued as before, using several clamps and blocks to pull up the joint. While this is drying, the $\frac{1}{4}$ -in. plywood panel which covers the front can be cut to size as in Figs. 5 and 11. The top edge is rabbeted to fit



snugly. The opening for the bookshelf can be cut on a bench saw by bringing the work down gradually over the rotating blade. This is then glued and bradded in place, allowing it to over-lap the corners $\frac{3}{8}$ in. When this has been done, the top unit, previously clamped, is glued to the extending rabbet of the front. A scrap block glued to the center of the rear cross-rail supports the top at the back. The corner is then formed round as before.

Made to fit flush with the edges, a box-like framework, Fig. 7, is glued and bradded to the opening to form the bookshelf. The assembly is now turned up-side-down and, using a ratchet brace, four $\frac{3}{4}$ -in. holes are bored in the lower end as shown in Fig. 6. What appears to be a solid shaped block at the top corners is simply four pieces glued together in layer fashion as in

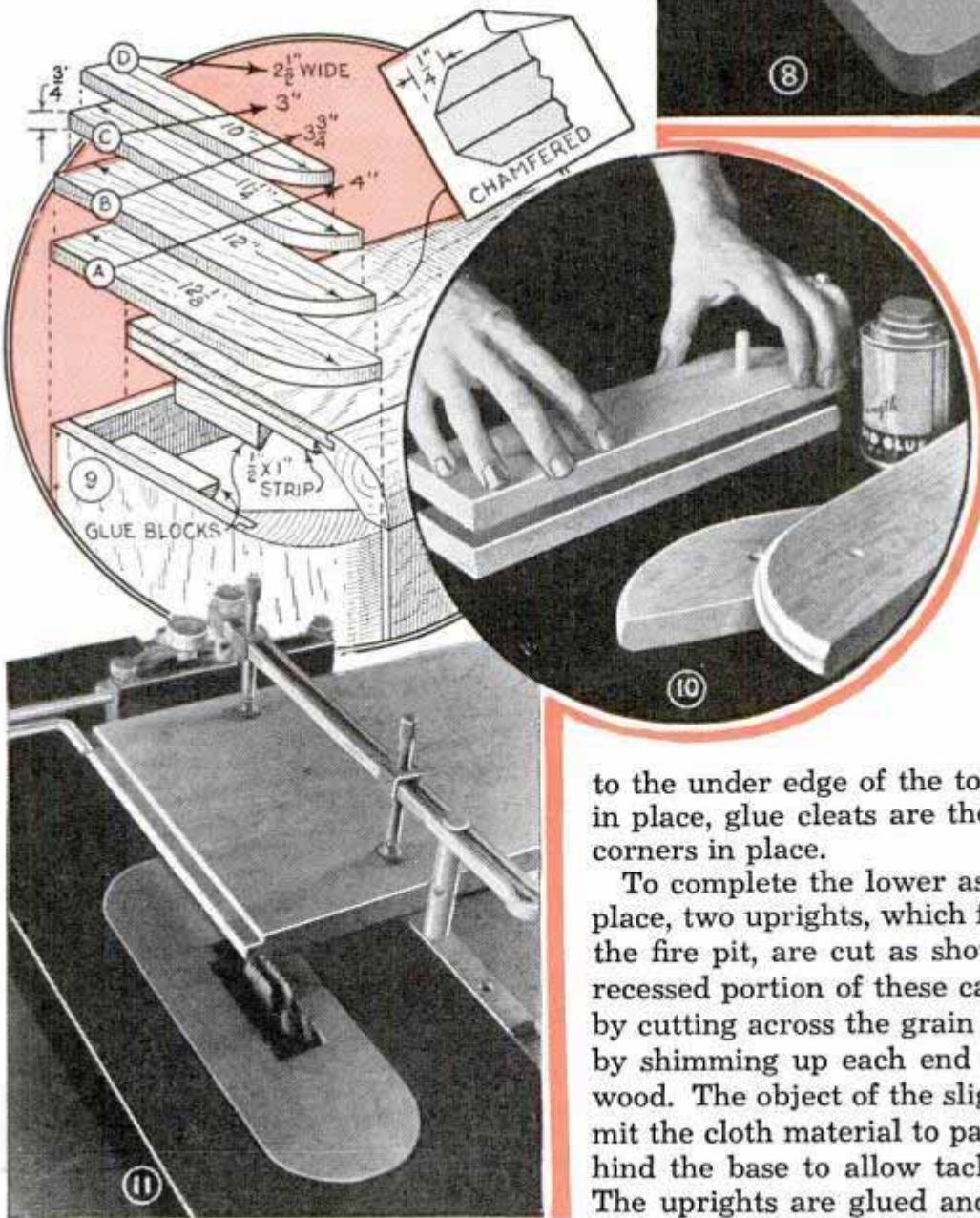
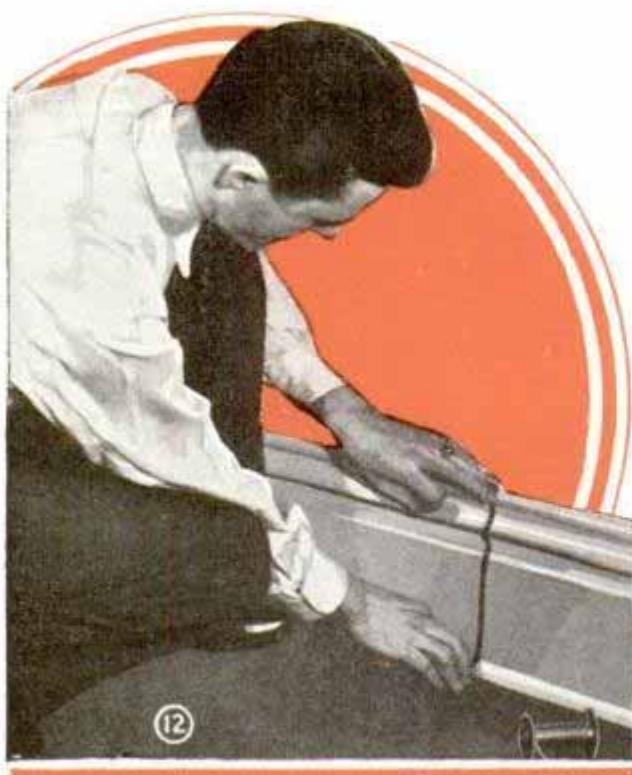


Fig. 9. These are cut separately to size and the outer edges chamfered. Short dowels passing through the pieces will prevent them shifting when gluing together, Fig. 10. Prior to gluing the assembled block in place at the corner, a narrow strip first should be glued

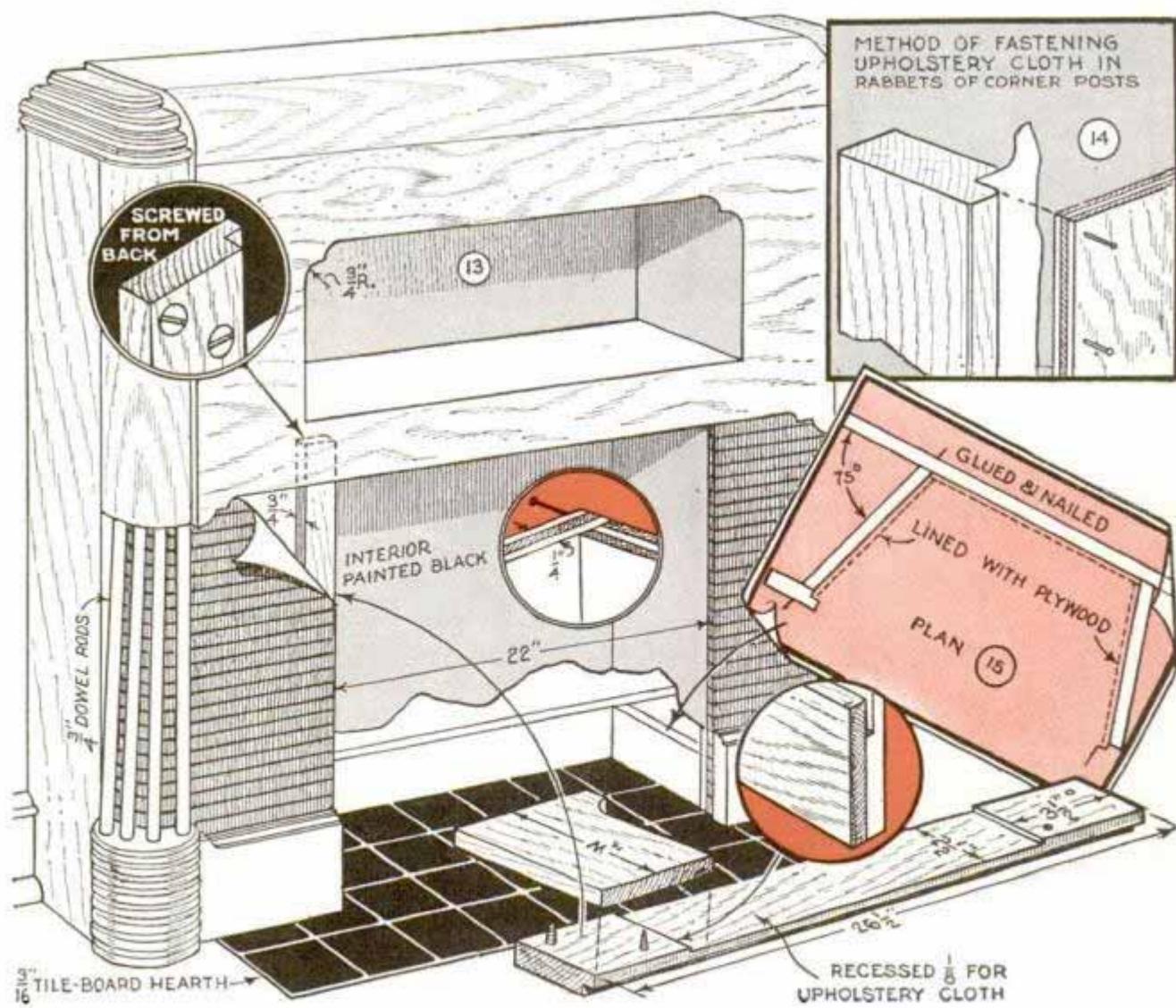
to the under edge of the top, Fig. 9. With this in place, glue cleats are then used to hold the corners in place.

To complete the lower assembly of the fireplace, two uprights, which form the opening of the fire pit, are cut as shown in Fig. 13. The recessed portion of these can be formed either by cutting across the grain with a dado saw or by shimming up each end with thin pieces of wood. The object of the slight recess is to permit the cloth material to pass between and behind the base to allow tacking from the rear. The uprights are glued and screwed from the



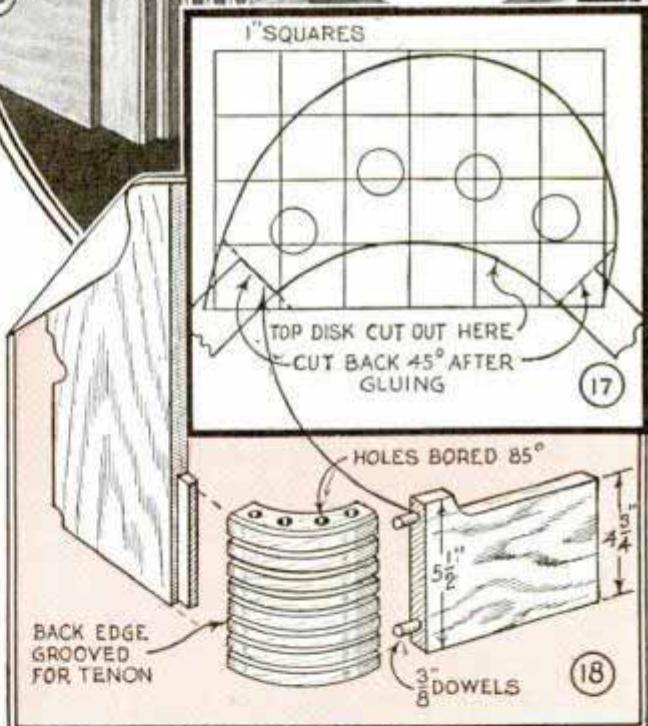
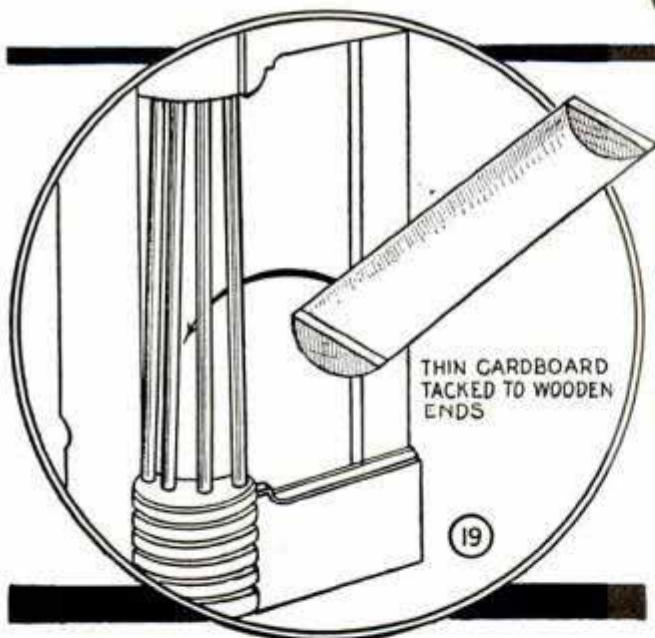
back in the position shown and are joined at the bottom with angle cut pieces which in turn are nailed to the back cross-rail, Fig. 15.

To form the shaped, built-up corners, Fig. 18, first make a cardboard templet by enlarging the pattern given in Fig. 17. Each right and left-hand corner block requires eight pieces cut to this shape from $\frac{3}{4}$ -in. pine, the outer edges being chamfered. The disk which is to be at the top of the stack should be cut as detailed in Fig. 17. These parts are then glued and nailed together. When dry, a shoulder is formed on each block by cutting back the corners at 45 degrees. A groove to take the tenon on the side piece is run in one shoulder cut while the other is bored to receive two short dowels in the base member. Using the templet previously made as a guide, bore the holes in the top of the blocks at a slight inward angle. The blocks now can be glued at their respective cor-



ners, inserting the $\frac{3}{4}$ -in. dowels at the same time.

To fit the upholstery cloth which forms a grille behind which a speaker baffle may be placed, first work the material in the recess at both top and bottom and bring around the rabbet cut as shown in Fig. 14. Over this, the side panels which line the interior of the opening are placed and bradded to the rabbet cut, neatly concealing the raw edge of the material. From then on it is merely a matter of stretching the cloth around behind the dowels, making it curve at the corner by inserting a cardboard form as shown in Fig. 19. This extends the full height of the opening and is held securely by nailing into the corner blocks. Finishing bone white, Fig. 16, completes the fireplace. Apply two or three coats as required, allowing the enamel to dry well between coats.

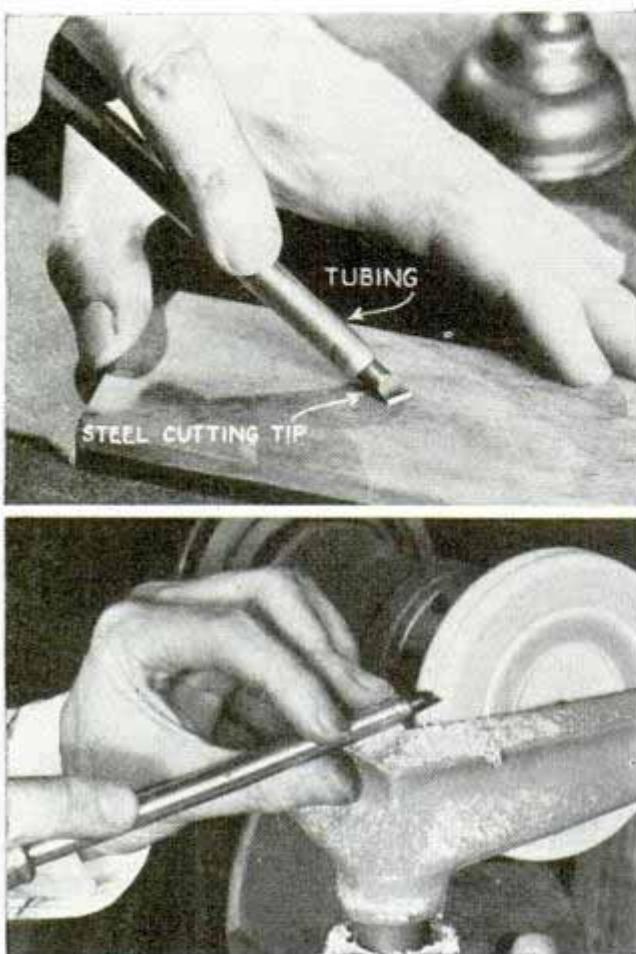


Clippings Pasted This Way Assure a Neater Scrapbook

The "scrap" appearance of a scrapbook can be eliminated by doing away with puckered edges where the paste has shrunk the clipping, and the print from the other side of the paper has "bled" through. Instead of using a mucilage dauber or paste brush for the job, get a roll of brown gummed paper. Place the clipping in position on the page. Hold it firmly with the left hand, using the first and third fingers. Then, with the right hand, moisten a piece

of the gummed paper and slide it underneath the edge of the clipping with the sticky side upward. Apply a little pressure with the second finger of the left hand on the clipping over the gummed paper and at the same time withdraw the latter so that some of the adhesive will be transferred to the underside of the clipping. Then press the clipping firmly in place, for which purpose the back of a spoon will be found useful.

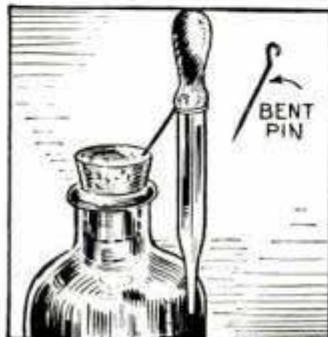
Turning Chisel for Tough Jobs Has Tip of High-Speed Steel



A wood-turning chisel that will hold an edge under such adverse conditions as overheating or the striking of a hidden nail can be made by fastening a piece of high-speed steel in the end of a soft-steel bar or rod. A short metal-turning lathe bit provides a good cutting tip. The rod or bar is drilled in the end to take the tip, which is soldered or brazed in place. Fitting a suitable handle to the chisel completes the job.

—Walter E. Burton, Akron, Ohio.

Pin Keeps Medicine Dropper Handy on Bottle



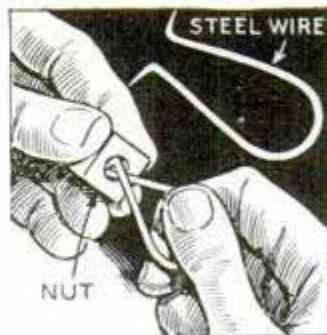
To have a medicine dropper handy at all times, bend a common pin as shown and slip it over the glass tube of the dropper, under the rubber bulb. The projecting point is

easily forced into the bottle cork and holds the dropper where it will not be overlooked or broken. If not too large, the pin will not interfere in any way with the suction of the bulb.

Cleaning Internal Threads

Dirt and grit that collect in internal threads, especially those of a nut, can be removed easily with a piece of steel wire pointed at the ends and bent as indicated. In use, compress the wire ends and "screw" them into the nut to be cleaned.

—Ivan J. Stretten, Detroit, Mich.

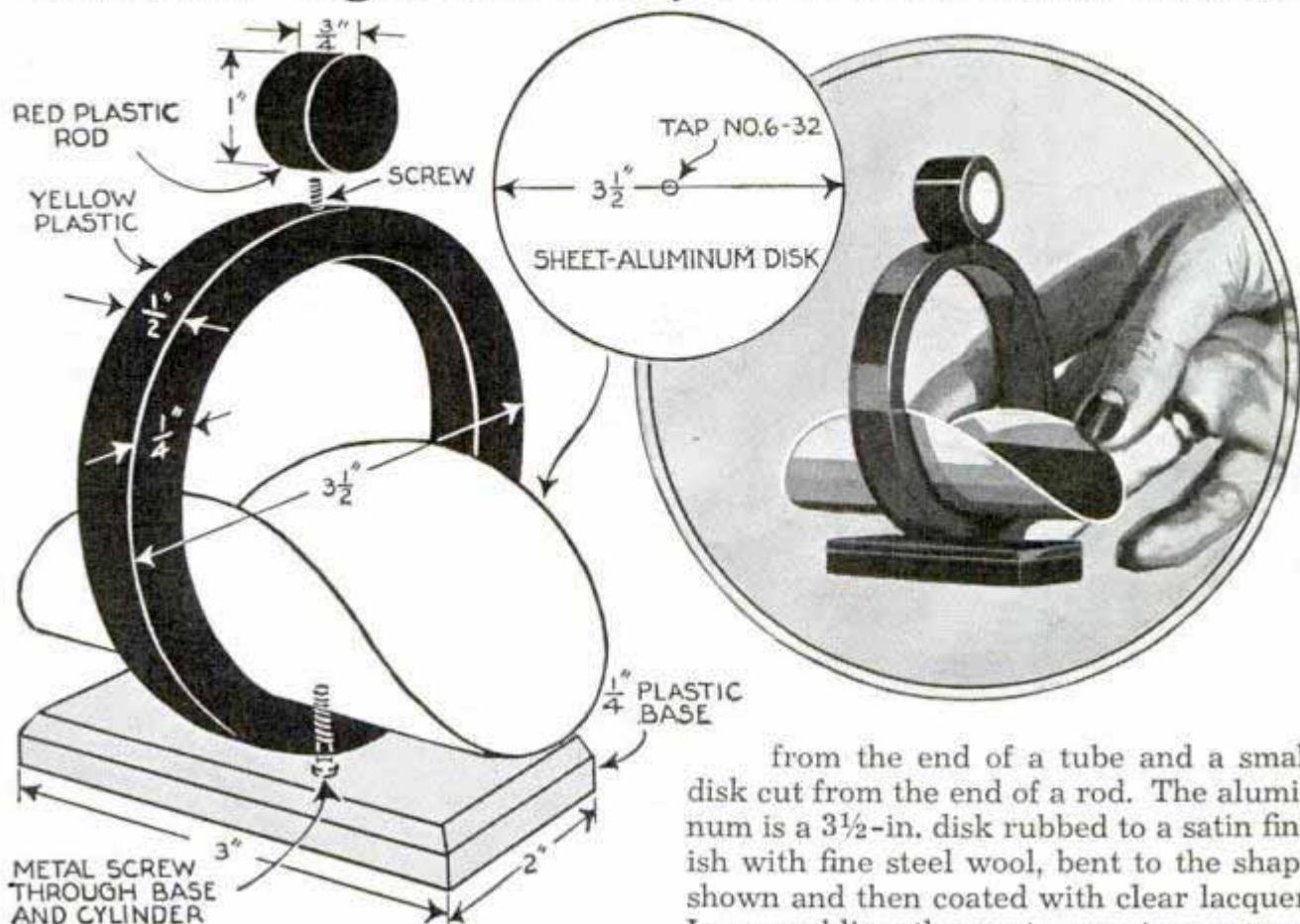


Mail Boxes Hidden in Columns Flanking Porch Steps

One city home owner embedded two rural mail boxes in stone columns that flanked his porch steps. The large boxes provided ample storage space for mail and were well hidden from view. If desired, one box can be used for incoming mail and the other for outgoing mail. Or, magazines and newspapers can be put in one and first-class matter can be put in the other.



Colorful Cigarette Tray of Metal and Plastic



Here's a snappy little cigarette tray in which brightly colored plastics are contrasted with aluminum rubbed to a satin finish. Three pieces of plastic are used; a flat piece for a base, a large ring sawed

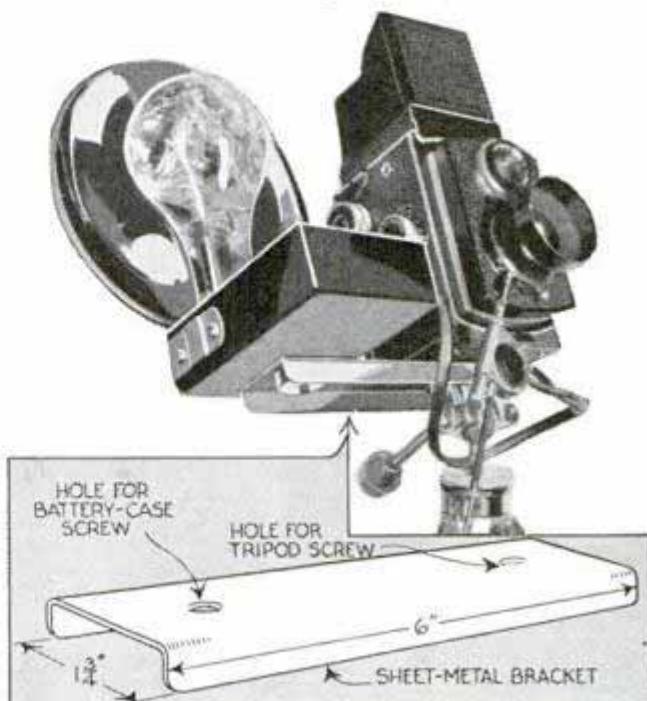
from the end of a tube and a small disk cut from the end of a rod. The aluminum is a $3\frac{1}{2}$ -in. disk rubbed to a satin finish with fine steel wool, bent to the shape shown and then coated with clear lacquer. In assembling the parts, use two screws, which are tapped into the lower side of the ring, and into the lower side of the plastic disk. The bottom screw is also driven into a hole tapped in the aluminum disk.

—H. R. Wallin, New York.

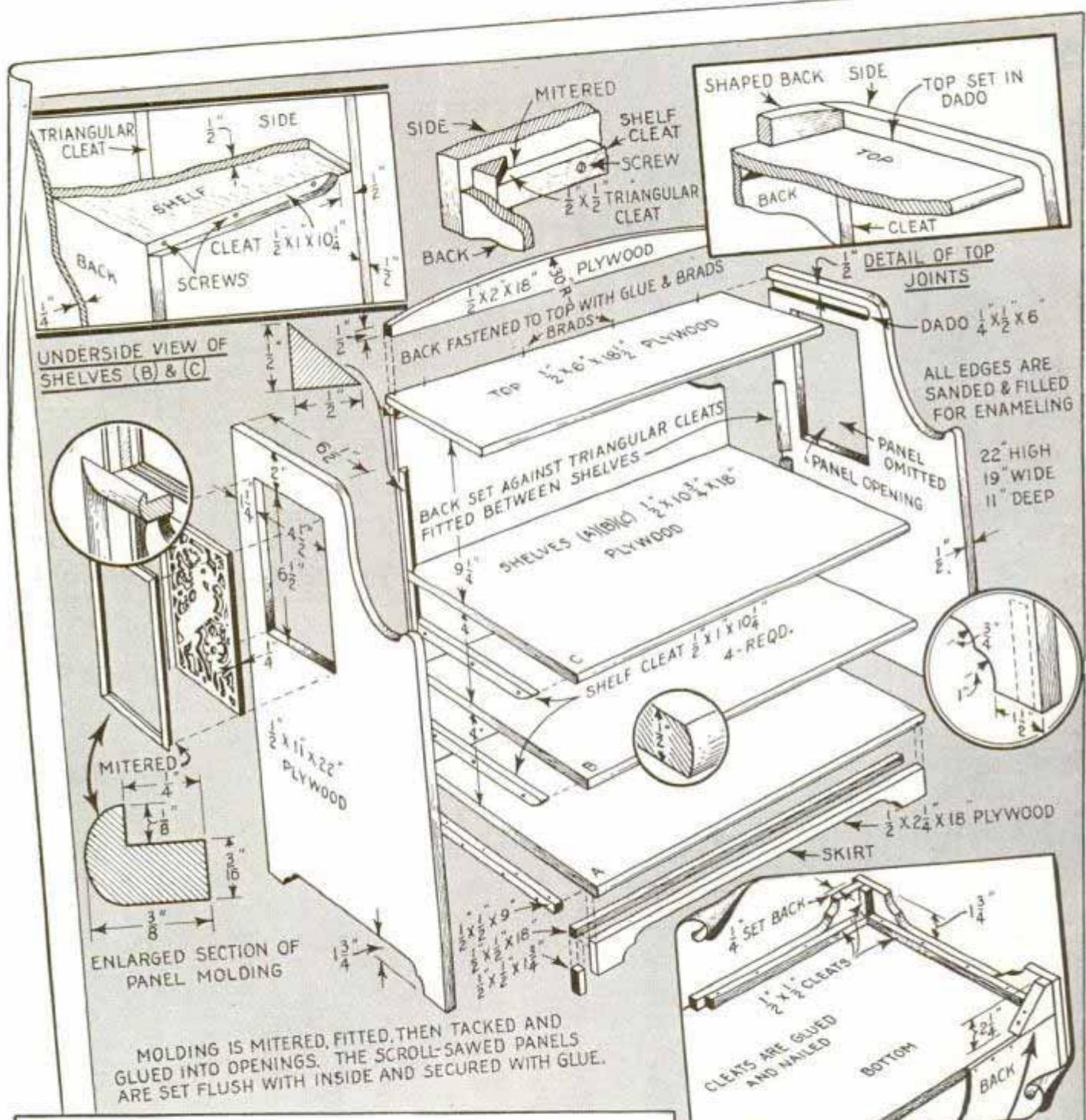
Camera and Flash Mechanism Held on Tripod by Bracket

When using a small camera that has but one tripod-screw socket in the base, with a speed-flash device incorporating a small battery case, synchronizer and reflector, this sheet-metal bracket enables you to attach the assembly to a tripod. The bracket is slipped over the tripod screw under the camera, and the flash mechanism is attached to the other end of the bracket. Thus, the entire assembly is tilted with the camera as one unit.—B. M. Ikert, Chicago.

If dirt becomes ground into a waxed floor, rub the spots with a cloth moistened with gasoline or turpentine until the wax coating is removed. Then wash the floor with alcohol and wax it to restore the polish. If the varnish is removed, apply white shellac before waxing again.

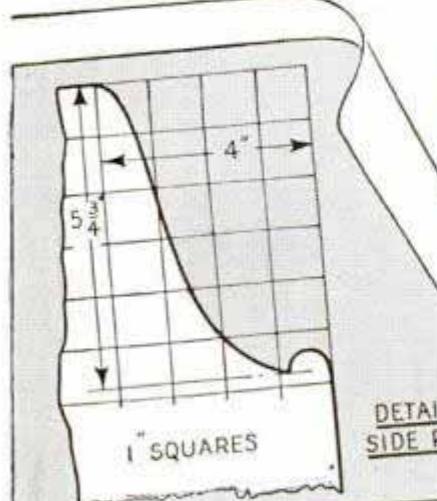


Chair-side MAGAZINE CASE



Your smoking and reading supplies are at hand on this cabinet, which fits snugly against the favorite easy chair. For economy and ease of construction, the larger pieces are fir plywood if the finish is to be enameled, but if you desire a natural finish, use mahogany or walnut plywood. First cut the side pieces to shape, dado for the top and cut the openings for the scroll-sawed panels. Then cut the shelves and top, sandpaper the edges, cut the back and skirt to size, fasten the cleats to the sides and assemble the parts with glue and nails.

has cut-out panels

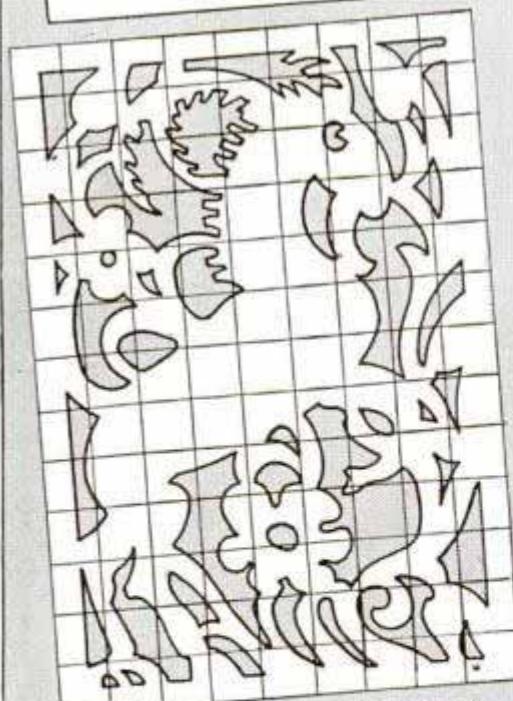


DETAIL OF
SIDE PANEL

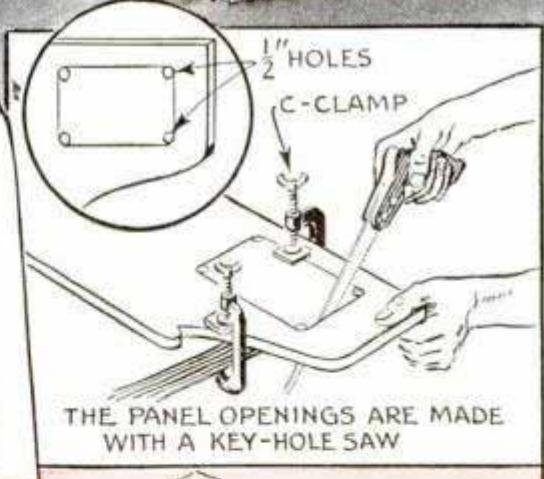
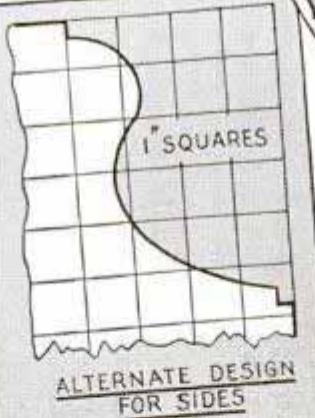


MATERIAL LIST

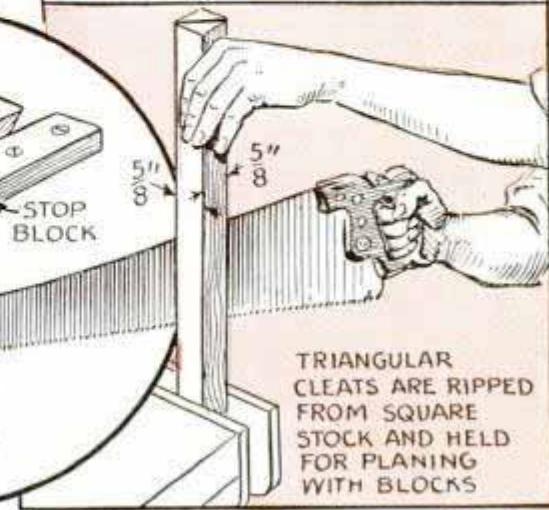
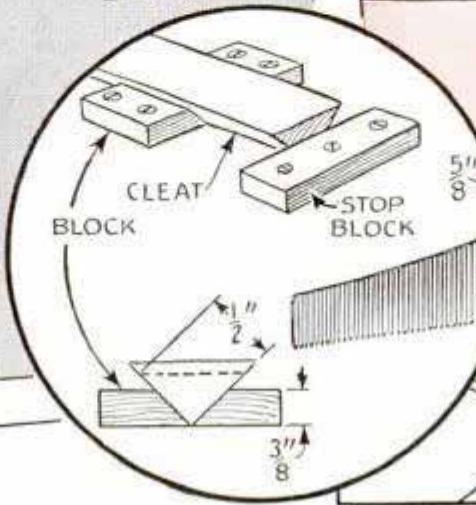
2 Pcs. $\frac{1}{2} \times 11 \times 22$ in. fir plywood—Sides
 3 Pcs. $\frac{1}{2} \times 10\frac{3}{4} \times 18$ in. fir plywood—Shelves
 1 Pc. $\frac{1}{2} \times 6 \times 18\frac{1}{2}$ in. fir plywood—Top
 1 Pc. $\frac{1}{2} \times 2 \times 18$ in. fir plywood—Shaped rail
 1 Pc. $\frac{1}{2} \times 2\frac{1}{4} \times 18$ in. fir plywood—Skirt
 1 Pc. $\frac{1}{4} \times 18 \times 18\frac{3}{4}$ in. fir plywood—Back
 2 Pcs. $\frac{1}{4} \times 4\frac{1}{2} \times 6\frac{1}{2}$ in. fir plywood—Panels
 2 Pcs. $\frac{1}{2} \times \frac{1}{2} \times 9$ in. white pine—Shelf cleats
 1 Pc. $\frac{1}{2} \times \frac{1}{2} \times 18$ in. white pine—Front cleat
 2 Pcs. $\frac{1}{2} \times \frac{1}{2} \times 1\frac{3}{4}$ in. white pine—End cleats
 4 Pcs. $\frac{1}{2} \times 1 \times 10\frac{1}{4}$ in. white pine—Shelf cleats
 2 Pcs. $\frac{1}{2} \times \frac{1}{2} \times 9\frac{1}{4}$ in. white pine—Triangular cleats
 4 Pcs. $\frac{1}{2} \times \frac{1}{2} \times 4$ in. white pine—Triangular cleats
 1 Pc. $\frac{1}{2} \times \frac{1}{2} \times 18$ in. white pine—Triangular cleats
 48 linear inches of $5\frac{1}{16} \times \frac{3}{8}$ in. white pine—Molding



DETAIL OF SCROLL-SAWED PANELS
 $\frac{1}{2}$ SQUARES 2 REQ'D.

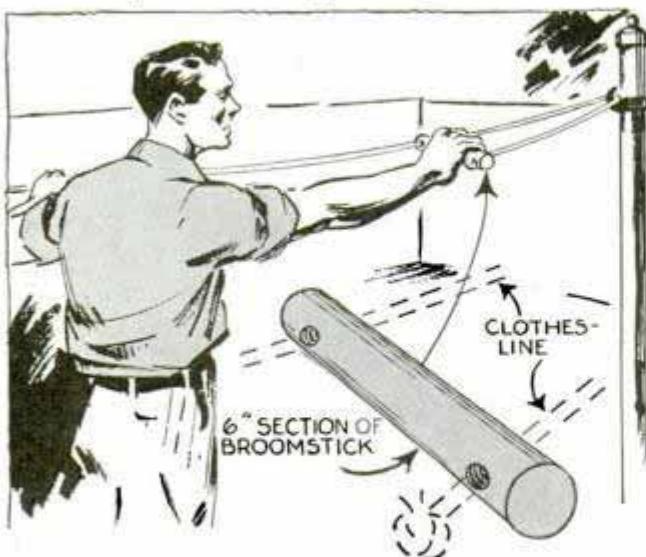


THE PANEL OPENINGS ARE MADE WITH A KEY-HOLE SAW



TRIANGULAR
CLEATS ARE RIPPED
FROM SQUARE
STOCK AND HELD
FOR PLANING
WITH BLOCKS

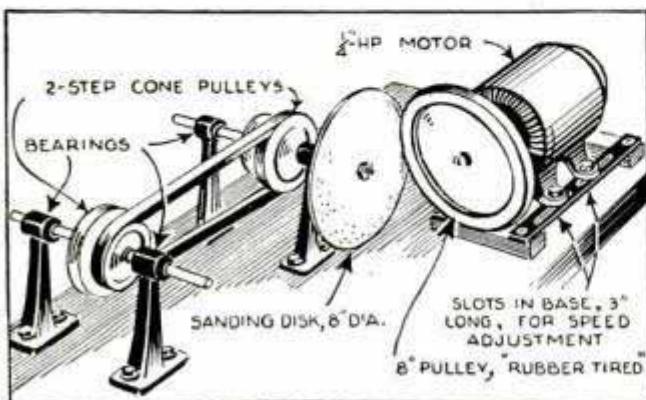
Clothesline Stretched and Held by Tent-Rope Tightener



To simplify stretching and fastening a rope clothesline, bore two holes through the ends of a 6-in. length of broomstick and slip the rope through these in the same manner as a tent-rope tightener. The loop thus formed in the rope may be slipped over the line hook in the support of the post and the tightener pulled along the rope to give it the proper tension. Striking the stick where the line passes through it will release it easily.

Friction-Drive Speed Reducer Handles Light Work

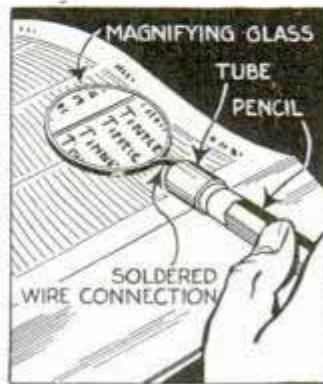
All you need for this speed reducer is a couple of jack shafts with bearings, two step pulleys and belt, a sanding disk and an 8-in. V-pulley. The parts are assembled as indicated and will give speeds ranging from 250 to 5,000 r.p.m. The V-pulley is lagged with a baby-carriage tire to provide a friction surface against the sanding disk. The motor base should have slots for the anchoring bolts so that it can



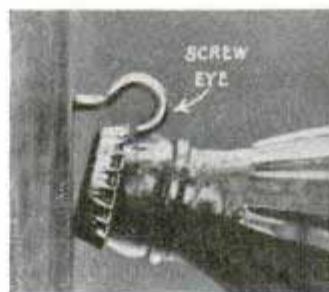
be moved at right angles to the sanding disk to get the desired speeds. Care must be taken in assembling the reducer as any misalignment will cause excessive vibration.—C. F. Travis, Verdun, Quebec, Can.

Magnifying Glass on Pencil Always at Hand

When small print in a 'phone directory or other book that you consult often and make notes from is difficult for you to read, use this magnifying glass. It is a very small one, which is soldered to a piece of tubing of a size to slip over the end of the pencil used in jotting down the notes.



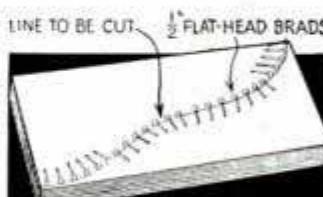
Screw Eye Removes Bottle Caps



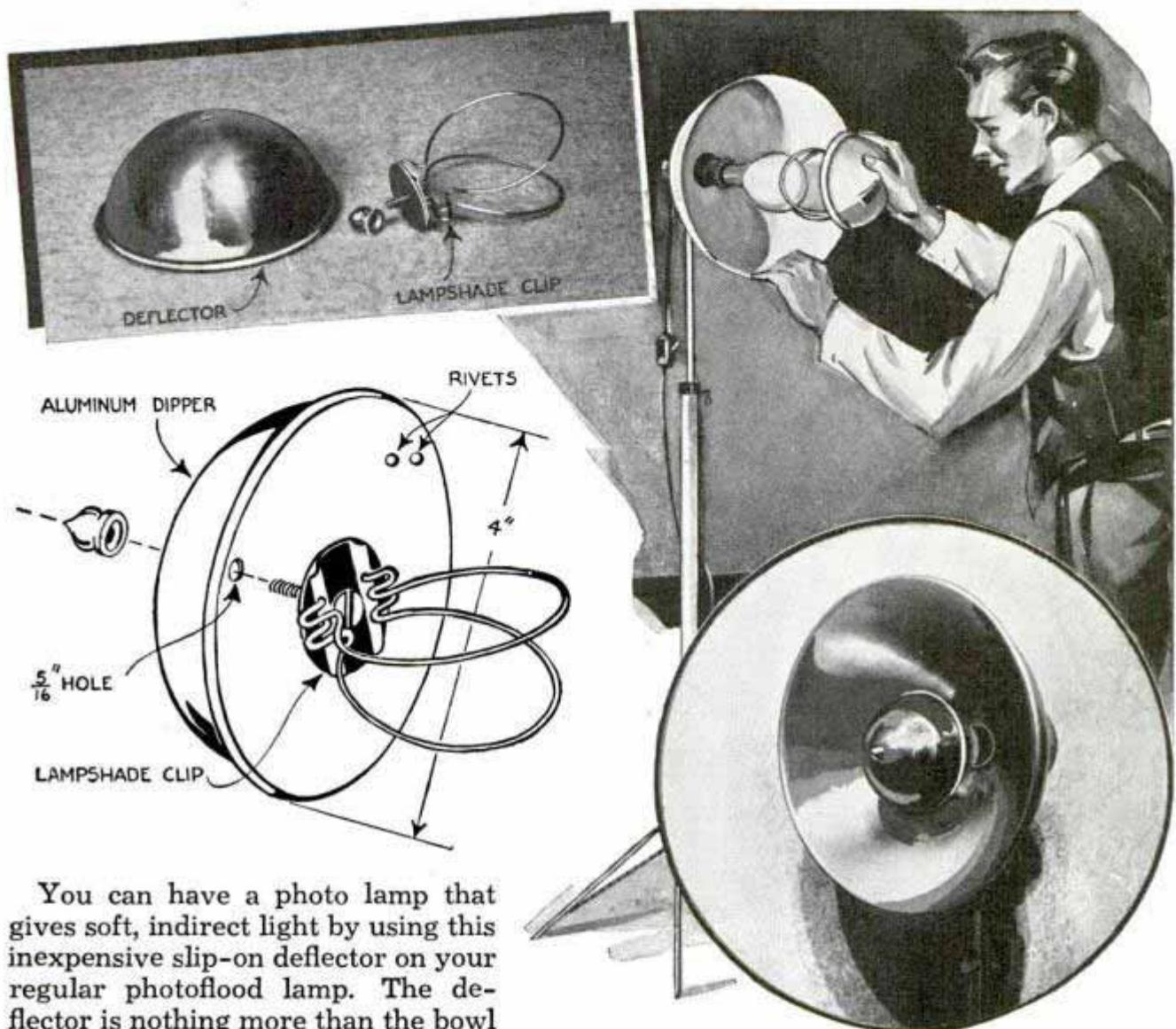
If you are on a picnic and have forgotten a bottle-cap remover, one can be improvised from a screw eye. Usually a screw eye can be found in some of the car tool kits. Open the eye as indicated and drive the screw into a board. If a file or stone is available, bevel the end of the eye so it will slip under the edge of the cap.

Duplicating Irregular Line from Layout Board

When there is an odd-shaped line on a layout board that must be duplicated the job can be simplified by using small brads. These are placed with their heads on the line to be duplicated as shown. Then the work to which the line is to be transferred is pressed down firmly on the brad heads. This will transfer the line accurately.—Ed Isakson, Oakland, Calif.



"y Deflector on Photo Lamp Gives Indirect Light

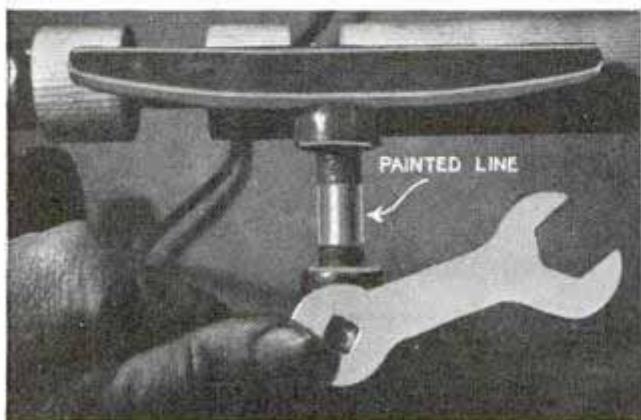


You can have a photo lamp that gives soft, indirect light by using this inexpensive slip-on deflector on your regular photoflood lamp. The deflector is nothing more than the bowl part of a ten-cent aluminum dipper, which is fitted to a clip of the type used in fastening a small lampshade to a bulb. The dipper should be about 4 in. in diameter and 1 3/4 in. deep. Deflectors are most effective when used in conjunction with

photoflood lamp reflectors that measure 10 in. or more in diameter. On reflectors smaller than this, there is not enough surface area to reflect the light properly.

—Arthur Trauffer, Davenport, Ia.

Painted Line Aids in Adjusting Height of Lathe Tool Rest



To save time in setting the tool rest of a woodworking lathe at the correct height above the centers, I painted a line or band on the post of the rest. A glance at the space between the lower edge of the line and top surface of the post socket casting indicates the height of the rest above the lathe centers. To paint the line, set the rest so that the top is exactly in line with the centers and apply the paint, using the top of the socket casting as the lower limit of the line.—W. C. Wilhite, Carlinville, Ill.

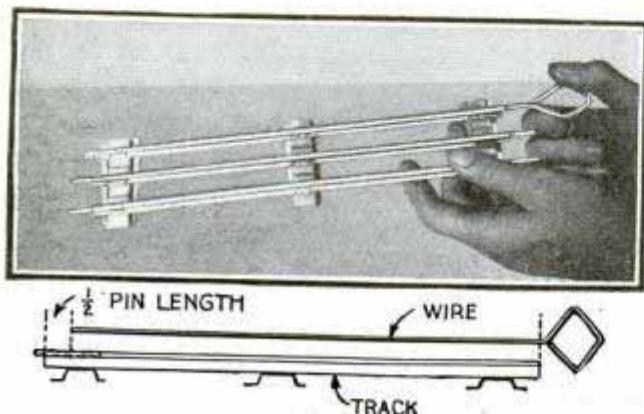
Handy Film Holder for Editing and Titling Home Movies



You will find this holder just the thing for home movie film when titling or editing it. Several 1-in. openings are made in a piece of stiff cardboard, which is then bent down around the edges so that when it is set in a box it is supported above the bottom. For 16-mm film, about $\frac{1}{16}$ in. of the cardboard edge should be bent down, while about $\frac{1}{16}$ in. will do for 8-mm film. Most any box will serve as a container, although a metal one is preferred as the film can then be stored in it. Cigarette tins are just the right size for the smaller film.

"Push Rod" Removes Pins in Toy-Train Track

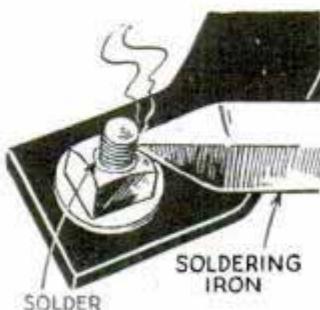
When the connecting pins in the ends of a toy-train track become forced into the hollow rails, this push rod is handy to remove them. It is a length of small steel



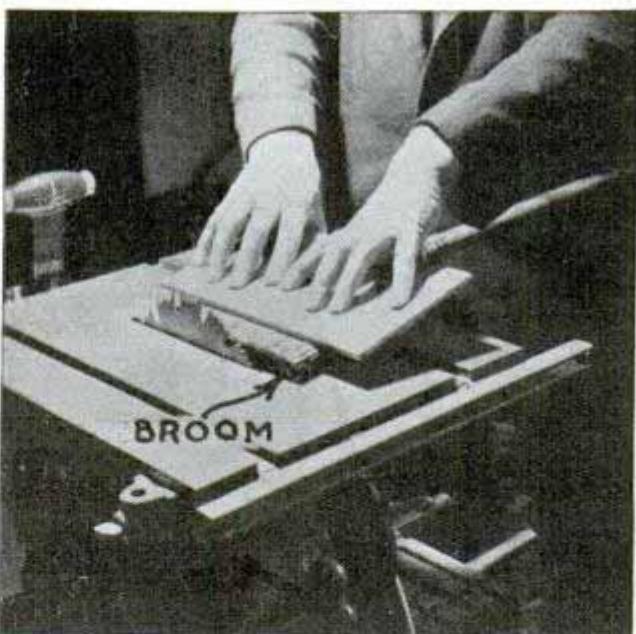
rod of size to slip into the hollow rail easily. One end is formed into a handle. The straight portion equals the length of a rail less one-half the length of a pin. Then when the rod is used to push out a pin it will automatically stop when half of the pin projects from the rail end.

Small Nuts Are Locked on Bolts by a Drop of Solder

If you have trouble keeping nuts tight on a child's wagon or doll carriage, just draw them up tightly and put a little solder on the first couple of threads above the nuts. This will keep them from loosening, and the solder can be removed with a pointed tool if it is necessary to remove the nuts.



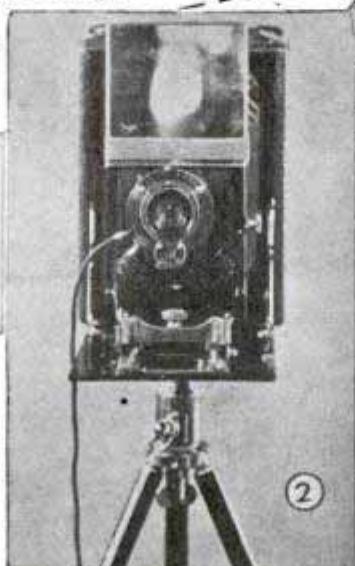
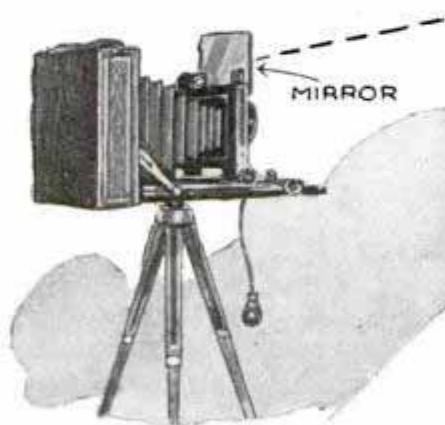
New Brooms from Old Ones



Old brooms that have worn at an angle can be sawed off straight to provide stiff broomstraw for shop use. To do this, set your circular saw for a deep cut so that the teeth will not push upward on the straws as the broom is moved over it. Use a wood block to compress the straws as shown in the photo.—Philip S. Maingery, Montreal West, Quebec, Can.

Take Your OWN PICTURE

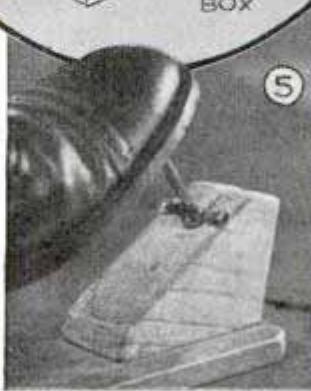
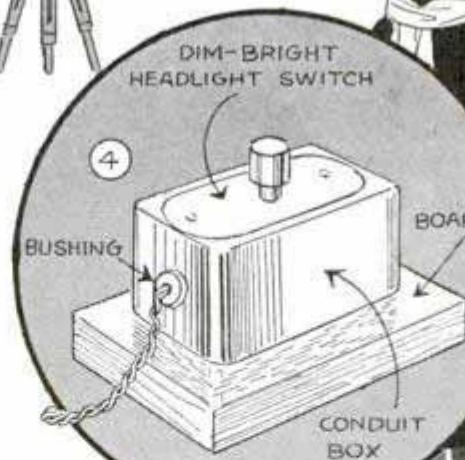
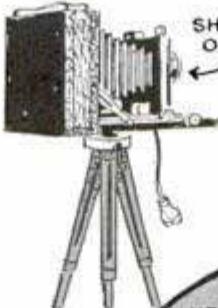
**Self Portraits Easily Taken
with Aid of a Floor Lamp
and Small Mirror**



By J. MODROCH

THERE are certain aids and accessories right in your own home that can be used to good advantage in making successful self portraits. For example, one of these is a common bridge lamp. By tilting the shade of the lamp you can center it accurately on a line with the camera lens, as in Fig. 1, by sighting through it. The shape and size of most shades approximate closely the size and general proportions of one's head. It has adequate mass and the desired roundness on which to play the beams of photo lamps for the purpose of gauging the proper lighting. Focusing is made easy when the lamp is lighted. Of course, it is essential that, before removing the lamp and substituting yourself, the exact position of the shade with relation to markings on floor and along the side lines should be noted. Then when you take your position as the subject, you will have a means of checking accurately on assumed pose with the position formerly held by the lamp.

A small mirror, secured to the camera





front with a rubber band, as shown in Fig. 2, will materially assist in composing the picture and setting facial expression. Say you are about to make a head-and-shoulder portrait of yourself. First, compose a picture of the lamp shade by viewing it on the ground-glass, or in the view finder. Then adjust the mirror on the camera so that the image of the shade will be centered in the glass when sighted through the shade, as in Fig. 1. Now, after placing yourself in the position of the lamp, it is only a matter of centering your own image in the mirror to be assured that the finished photo will turn out as you composed the "stand-in" picture.

Releasing the camera shutter once you are posed can be done by employing either a delayed-action mechanism or an extension cable release operated with your foot as in Fig. 5. While delayed-action mechanisms are built into certain types of shutters, attachments that do the same job may be used with most shutters of standard make. It is necessary, however, when using delayed action in self-portraiture, to assume the pose quickly after setting the timer going, since the shutter will be released in a few seconds at most. This is

sometimes a disadvantage and can be overcome by using an extension cable release. The latter are regularly sold in lengths up to 10 ft. and can be run along the floor out of camera range to your hand or foot as in Figs. 5 and 6. Practically every portrait, including even full-figure shots, can be composed with a hand or foot hidden, free to depress plunger of extension cable as in Fig. 7. Another method of controlling exposure requires that the pose be assumed in a room totally dark except for the faint glow of a negative-developing safelight, Fig. 3. With the camera shutter open, the lights are turned on by means of a foot or hand-operated switch, Fig. 4,

governing the exposure by the length of time the lights are on. This method cannot be recommended for poses in which the eyes will appear prominent in the finished picture. A red safelight can be used if camera is loaded with orthochromatic film, but a green light of very low intensity must be used with panchromatic film.

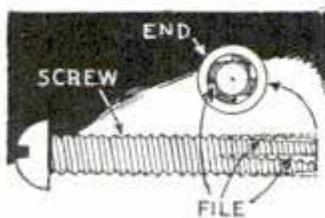
Forehead Writing Gives Fun at Your Party

At your next party when the fun begins to slow down, you can pep up the evening



by having your guests practice forehead writing. Give each one a pencil and a strip of paper about 2 in. wide and 6 in. long. Then have them hold the paper across their foreheads and write their names. The result will be mysterious scribbling that usually can be deciphered only by viewing the writing with a mirror. When looked at in reverse, the person's name appears quite distinctly.

Improvised Tap for Soft Material



When a hole has to be tapped into wood or other soft material for a screw with an odd thread for which there is no tap at hand, you can make a tap for the purpose from one of the screws. The screw is held in a vise and flutes are filed as shown, being sure that the cutting edges are the leading edges of the flutes. Undersize holes must be drilled to start the tap, and the end of the latter must be tapered to the hole size to facilitate starting.

—Earl Pagett, Coffeyville, Kan.

Lice in Chicken House Removed with Aid of a Banana Stem



Owners of a few chickens will find that banana stems are an aid in protecting them against lice and mites. When the stems are hung against the walls and roosts, the vermin are attracted to them from cracks and crevices where they usually gather. Each morning the vermin should be removed from the banana stem and destroyed.

An effective way to prevent cut worms from bothering plants in either vegetable or flower gardens is to surround each plant with a row of ordinary kitchen matches, stuck into the ground with the heads down.

Gate Shielded to Prevent Child from Swinging on It



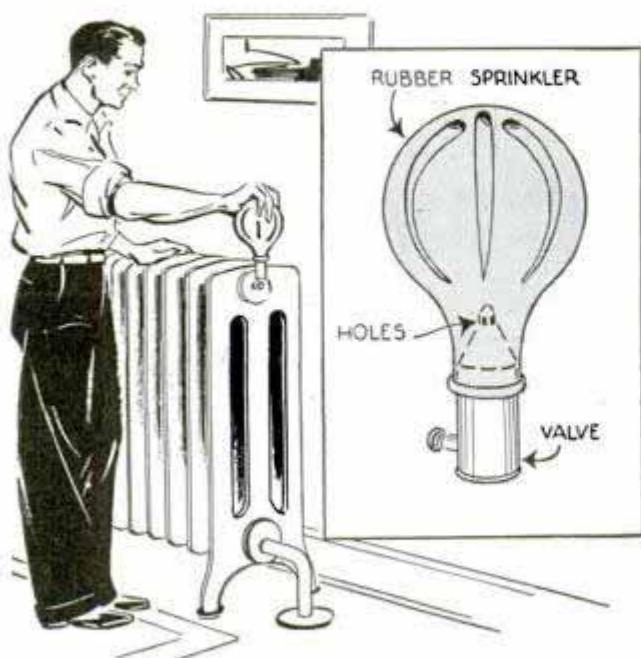
If you have small children who like to swing on a yard gate, stretch chicken wire tautly across both sides. This tends to prevent them from getting their feet on the lower cross member. If the wire is painted the same color as the gate, it will be much less noticeable.

Paraffin Waterproofs Paper Tape in Open Dispensers

Rolls of gummed paper tape used in open dispensers are often ruined by having water splashed onto the sides so that the glue sets and will not allow the tape to be removed. If a bar of paraffin is rubbed over the sides of the rolls, the wax will serve as a protection against water without affecting the adhesive surface of the tape.



Rubber Bulb Loosens Thermostat in Radiator Air Valve

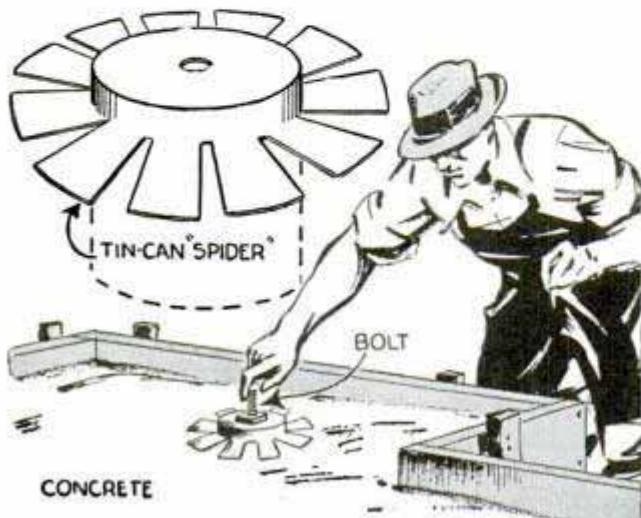


Tiring of frequently calling the superintendent of our building to loosen a stuck radiator valve, I found that it could be repaired with a rubber bulb such as used for sprinkling clothes. I just slipped the mouth of the sprinkler over the upper end of the valve and repeatedly pressed the bulb. This forced air in and out of the valve so that it would start working.

—H. G. Gunther, Sunnyside, L. I., N. Y.

Tin-Can "Spider" Holds Bolt in Cement Form

When a bolt must be set in cement and difficulty is experienced in supporting it with a crosspiece, cut a tin can to form a "spider" as shown, and use it to hold the

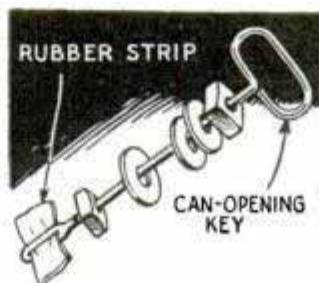


bolt in the position that is desired. If necessary, the tin may be left in place after the job is completed.

Camera Tripod Steadied on Floor by Adjustable Wire Brace

Here is a simple brace for the legs of a tripod, and it is adjusted instantly to spread the legs as desired. Several screw eyes are driven into the legs, as indicated, to take a length of stiff wire, which has hooks bent on the ends. After adjusting the legs as desired, drop the wire into two of the screw eyes.—Dale Van Horn, Lincoln, Nebr.

Nuts and Washers on Can Key Are Easy to Find

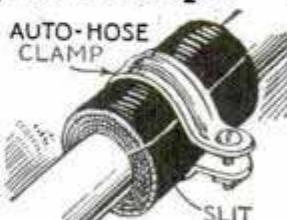


Instead of keeping nuts and washers loosely in a drawer where it is difficult to find the size wanted, collect a few can-opening keys, sort the nuts to size

and slip them over the keys. A rubber strip inserted in the eye at the end of each key will keep the nuts in place, yet they can be pulled off or slipped on over it and held conveniently for use when needed.

Emergency Repair for Pipe

If one of your plumbing pipes suddenly develops a leak, it can be repaired temporarily with a piece of garden hose. Use a 2-in. length and slit it along one side. Slip this over the leak and hold it in place with a hose clamp. Place the clamp directly over the leak. Sometimes, it may be necessary to use more than one clamp.

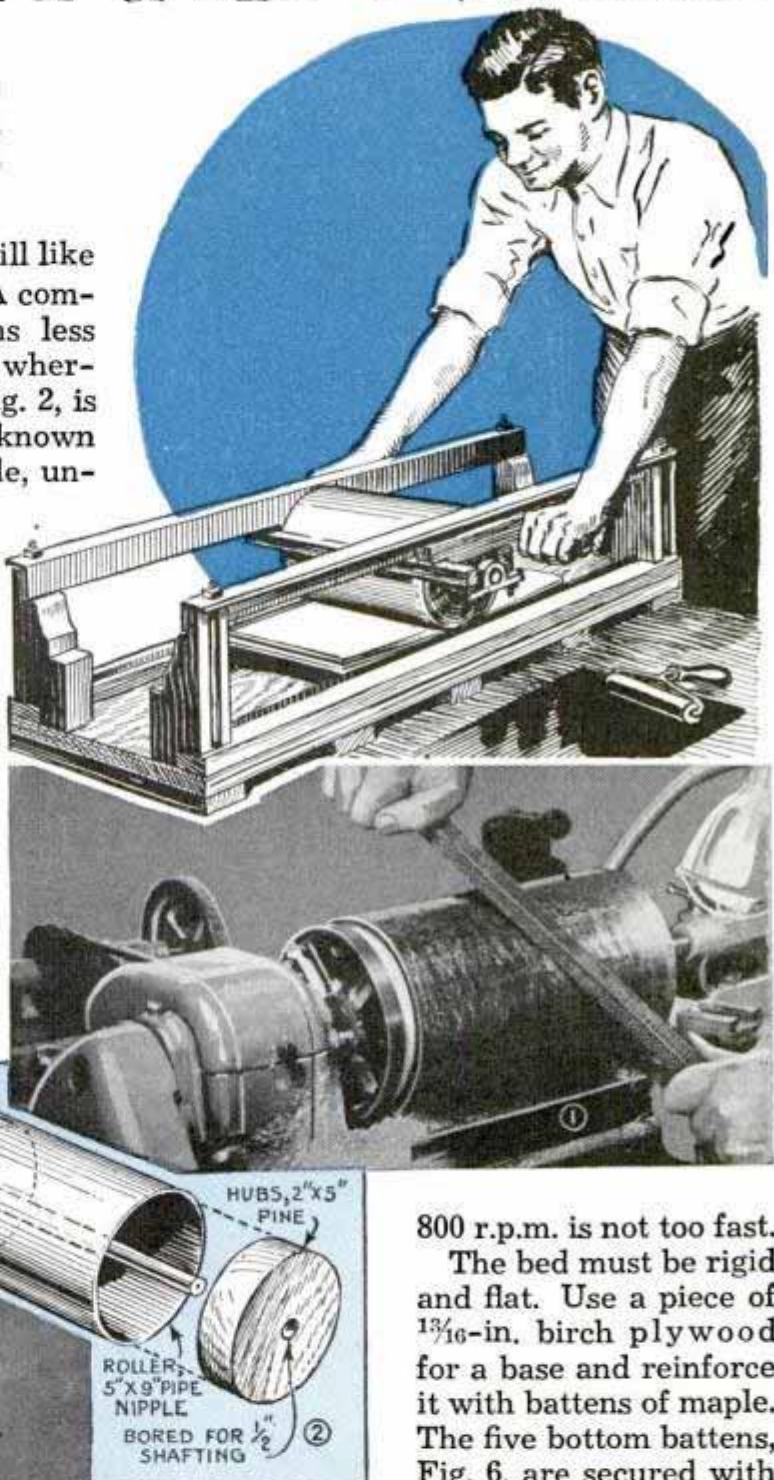


—Cornelius T. Greydanus, Paterson, N. J.

Juniors' New HAND PRESS

Light in weight and accurate in operation. Chase is built in the bed to hold type or cuts

PORTABILITY is the thing you will like about this little printing press. A complete self-contained unit, it weighs less than 30 lbs., and is ready for work wherever you set it down. The roller, Fig. 2, is made from a length of steam pipe, known to steam fitters as a 5 by 9-in. nipple, unthreaded. Cut wood hubs to make a press fit inside the pipe, and with the shaft in place and bearing against the tailstock of the lathe, work the pipe up and on the hub which has been mounted on the faceplate. Then center the opposite hub on the tailstock center. Of course, if a metal lathe with sufficient swing is available, turning down the cylinder will take only a few minutes, but even on a wood lathe a good job can be done with nothing more than a coarse square file as in Fig. 1. To start, keep the speed down below 200 r.p.m. When the irregularities are removed, raise it to 500 r.p.m. and for the final polish with emery cloth,

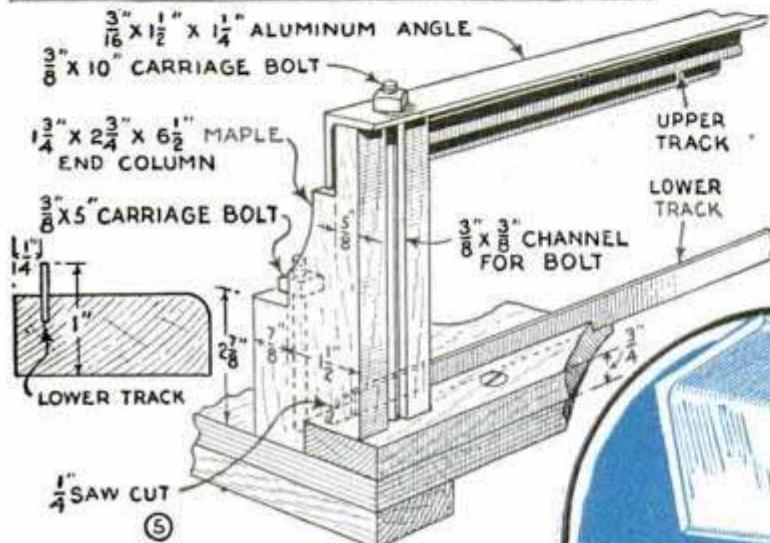


800 r.p.m. is not too fast.

The bed must be rigid and flat. Use a piece of $1\frac{3}{16}$ -in. birch plywood for a base and reinforce it with battens of maple. The five bottom battens, Fig. 6, are secured with casein glue and screws.

Pencil the location of each batten on the bottom of the panel, size the marked strip with glue and let it soak in for several minutes. Coat again, spread glue on the batten and press together with a rotary motion to force out air bubbles. Clamp in place and drive in three screws. Wipe off excess glue with a damp cloth. Holes must be bored to the body size of the screw in the battens, and countersunk, but let the





screw thread cut its own way into the plywood.

The compartment in which the cuts are placed is called a chase, Figs. 6 and 9. To make this, the two rails are mortised and end pieces set in place, Fig. 6. This assembly is squared, clamped, then glued and screwed down as a unit. For additional strength, drive glued dowel pins around the circumference of the chase as indicated.

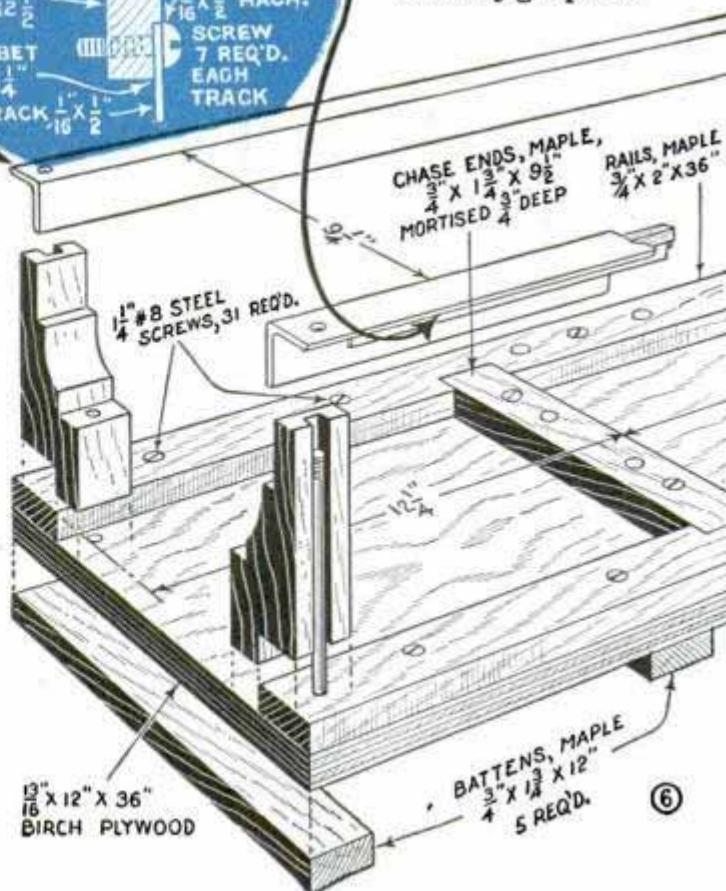
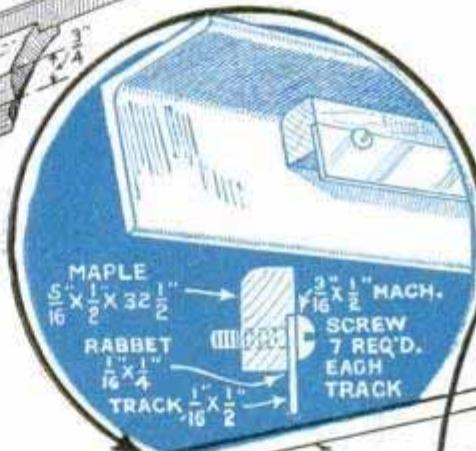
The steel track is the type used in showcases with heavy sliding doors. A length of $\frac{1}{2}$ by $\frac{1}{16}$ -in. by 12 ft. will be needed. Run a cut the entire length of each rail with a planer saw blade, Figs. 5 and 8, but insert a piece of track only 34 in. long. The ends are held in place by the columns which will be installed later. Varnish the assembled bed, using a thin, penetrating marine varnish to seal the wood and prevent absorption of moisture.

The end columns, Figs. 3 and 5, must be identical and of the exact dimensions indicated. Do not glue these down, and don't tighten the bolts all the way until after the

press is assembled. Aluminum angles are used for upper-track supports. The track, in this case, is rabbeted into a maple strip as in the circular detail, Fig. 6, and is anchored to the angle by machine screws threaded into it. Positive dimensions on the truck are impossible, for the measurements depend entirely upon the sheaves and pillow blocks. Select ball-bearing sheaves and bronze, one-piece pillow blocks, following the general details of Fig. 7. As you see, the truck assembly, including the roller, is comparatively light yet it is so arranged that the four compression springs, Figs. 6 and 7, exert more than 120 lbs. pressure at the point of contact between cut and paper. This assures uniform printing.

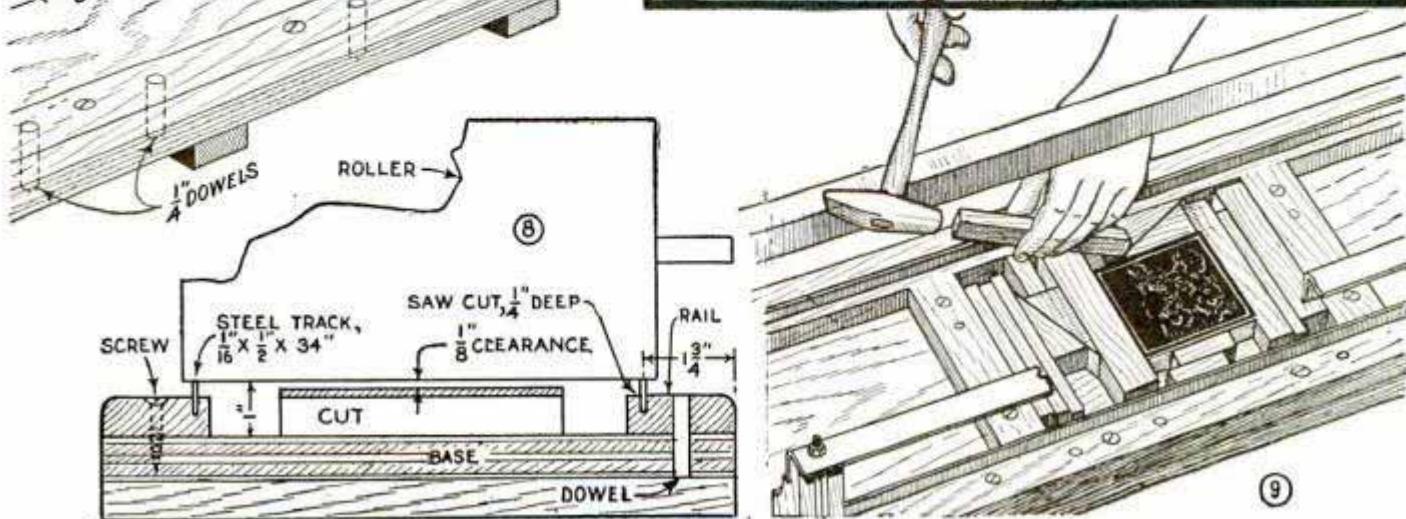
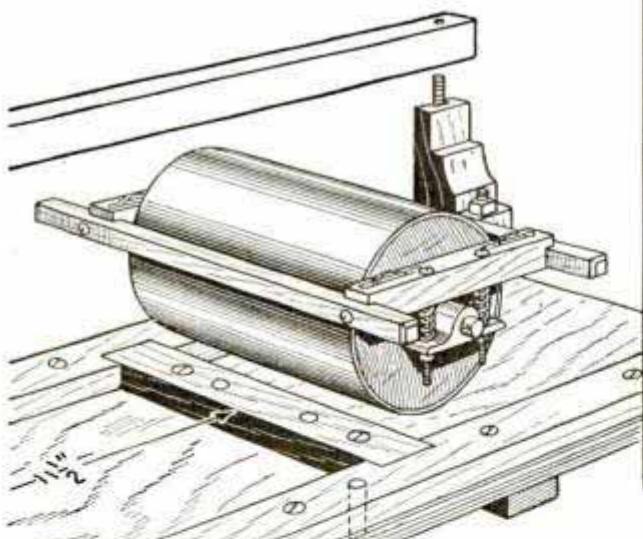
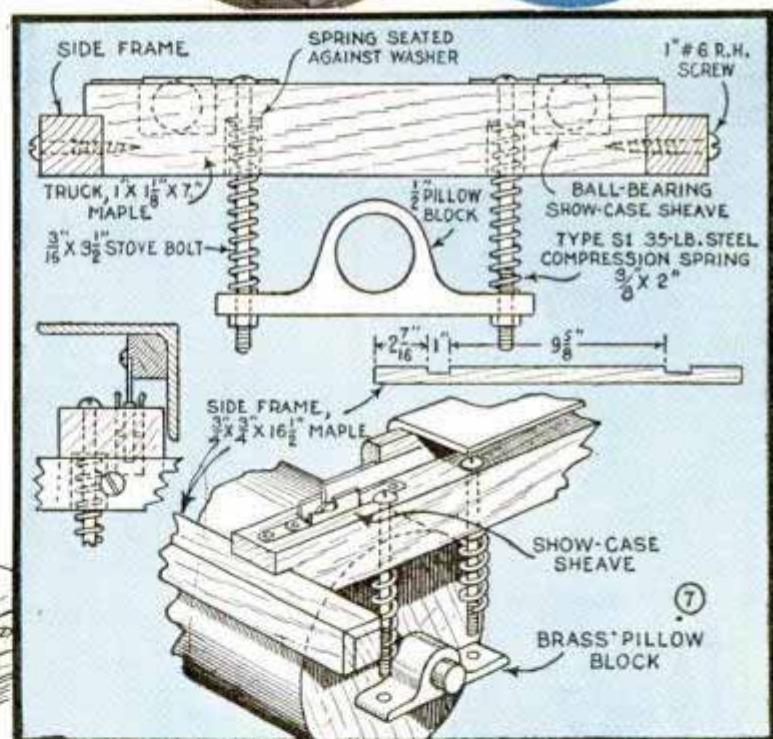
In assembling, tighten the nuts on the stove bolts, Fig. 7, and set the complete roller and truck unit on the lower track. Slip the angles in place, Fig. 3,

and bolt them down. Oil the pillow blocks and sheaves, and coat the surfaces of the aluminum angles lightly with dry graphite.

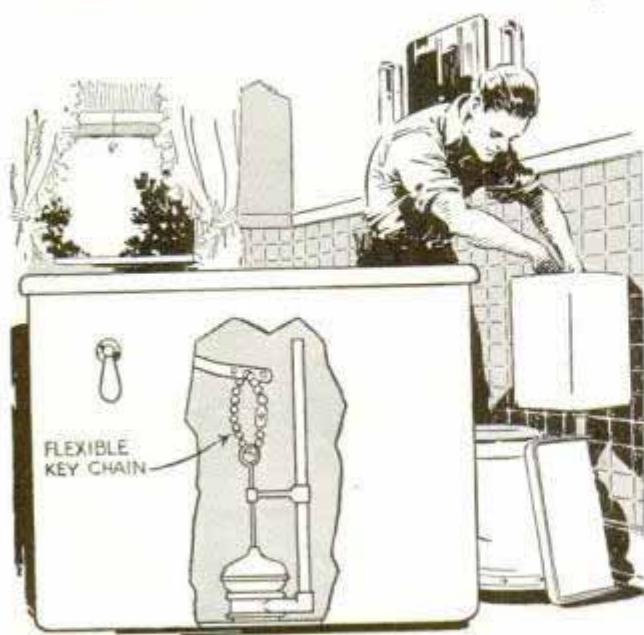


The first requisite for printing is the proper ink and a roller for applying. Wood cuts take a different grade of ink than metal type, so specify the use when purchasing. Squeeze some ink on a sheet of glass, Fig. 4, and roll it out till it contacts the roller for better than a complete revolution. Before printing, the cuts must be locked securely in the frame. Cut an assortment of maple fillers and two pairs of wedges, Fig. 9, and arrange these about the cut so that when you drive the wedges tight the cut will be locked in both directions. The cut is inked by contact with the charged printing roller. Rub in both directions and cornerwise to make sure the entire surface is evenly coated. Use thin cardboard sheets for an impression pad.

The actual impression requires reasonable skill. With the paper in contact with the cut and the pad in place, advance the roller until it rises from the lower rails and rests on the pad. Now pull toward you slowly until the roller drops to the rails again. Lift the pad carefully and peel the paper from the cut.



Flexible Linkage in Flush Tank Lets Ball Valve Seat Correctly

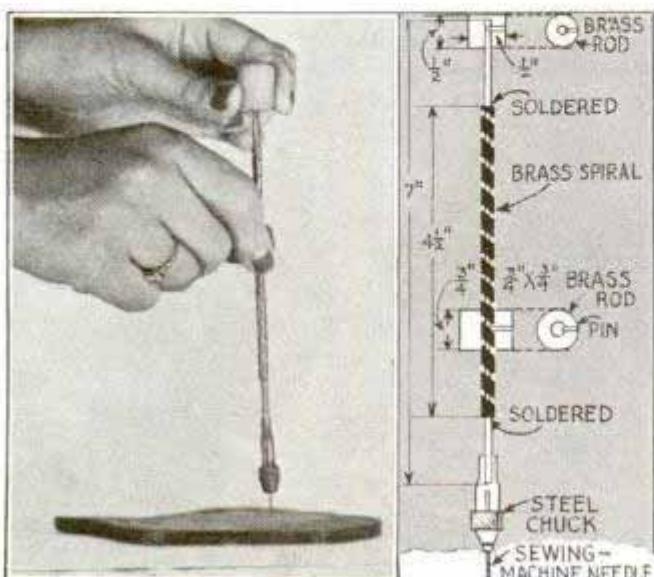


If the ball valve in your bathroom flush tank sticks, the trouble may be caused by the linkage between the ball and the trip lever. This sometimes binds and prevents the ball from dropping. I replaced the original linkage in my tank with a key chain. This is very flexible and prevents any possibility of binding.

—DeL. C. Jones, Columbia, S. C.

Drill to Use in Model Making Assembled from Scrap Parts

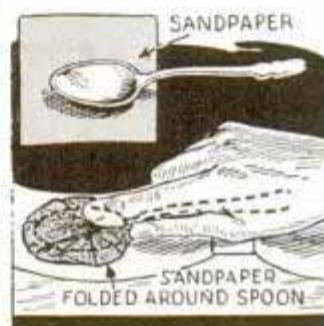
This handy drill for use in making model ships, planes, etc., is constructed easily. A 7-in. length of $\frac{1}{8}$ -in. brass or steel rod is used for the shaft, and a spiral, removed



from an automatic lead pencil, serves as a rotating device, which is soldered at the ends to the brass shaft. A finger grip, which rotates the drill when moved up and down the spiral, is made from a $\frac{3}{4}$ -in. length of brass rod. This has a hole drilled through the center so it will slide loosely over the spiral, and is fitted with a pin, which extends slightly into the center of the hole to engage the spiral. The chuck is one removed from a small pin drill. Drill bits are made from steel sewing needles.

Sanding Block for Curved Work from Teaspoon

I have found that small, irregular-shaped work can be finished easily and quickly with an old spoon having the bowl covered



with a piece of sandpaper. The sandpaper is cut so that the ends can be folded over the edge into the bowl of the spoon. The handle is held in the hand while one finger presses down on the ends

of the sandpaper, which rest in the hollow

of the bowl. If the spoon is held on edge,

sanding grooves will be easier.

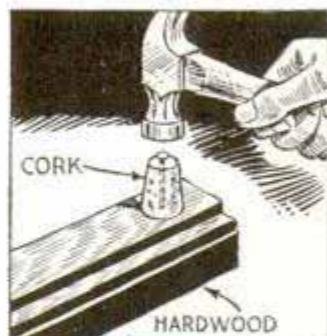
—Harvey Paisley, Edmonton, Can.

Cork Aids in Driving Thin Nail

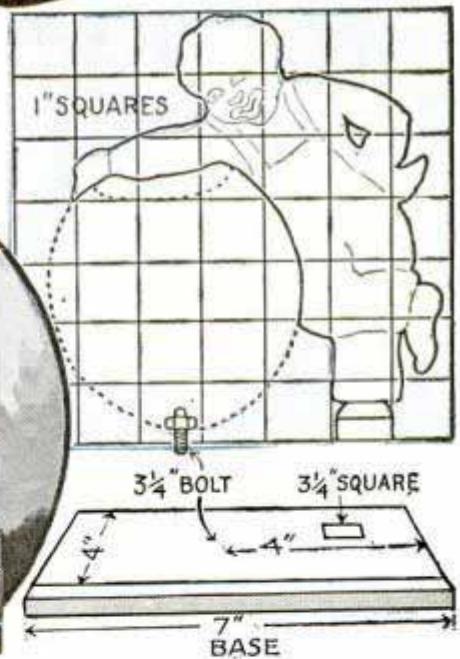
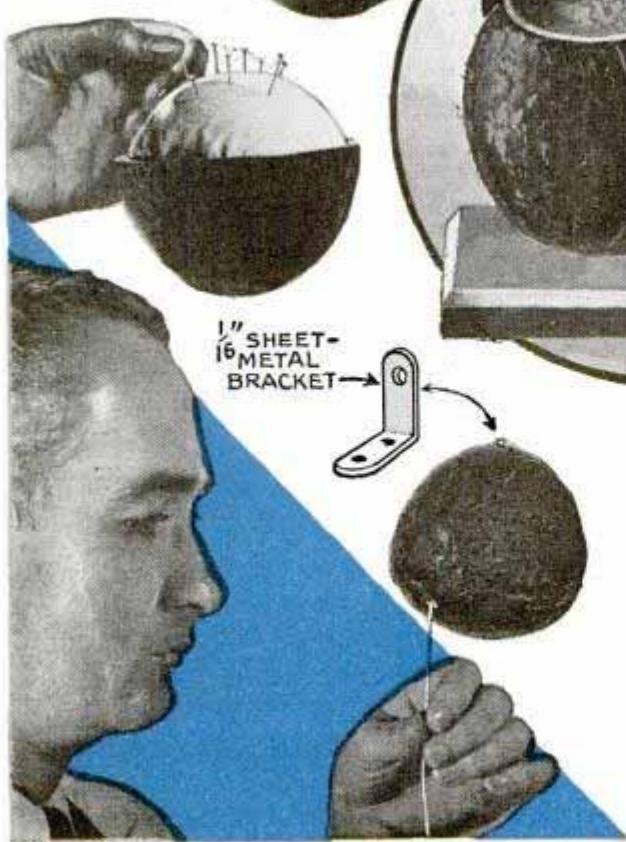
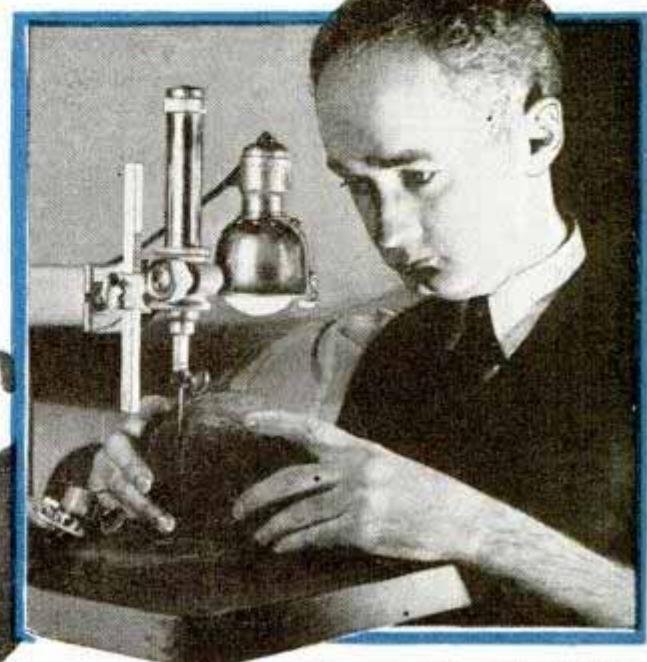
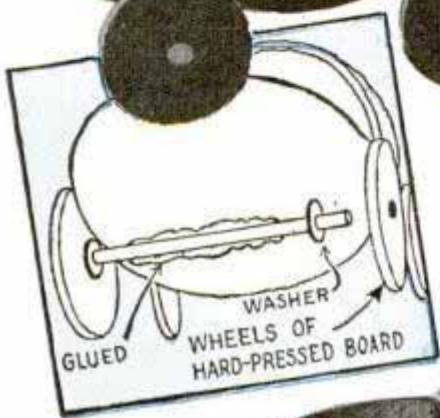
Difficulty of driving a slender finishing nail into hardwood without it bending can be avoided with a cork. Just drive the nail through the cork and into the wood. After the nail has been started well into the work, the cork is pulled off over the head and the driving of the nail completed.

—James F. Ferguson, Oregon, Ill.

An alarm clock will save much waiting and worrying when baking. Undivided attention then may be given to other duties.



CRAFT with COCONUT SHELLS



Sawhorse Slotted to Hold Saw When Not in Use



Cut a long slot in the cross member of one of your sawhorses and drop your saw in it when not in use. The saw is always at hand, and it cannot fall down, which might damage the teeth.

—Guy Wheeler, Eureka Springs, Ark.

Toothbrush Handle Scrapes Plated Parts

When you want to remove dried grease from plated parts, such as those on a car, use an old toothbrush handle. It is tough enough to scrape off the grease, yet is soft



enough to avoid scratching the metal. The end of the handle can be shaped with sandpaper as desired, to clean grooves, recesses, etc.

"Lung Tester" for Fun at Party Will Mystify Your Friends

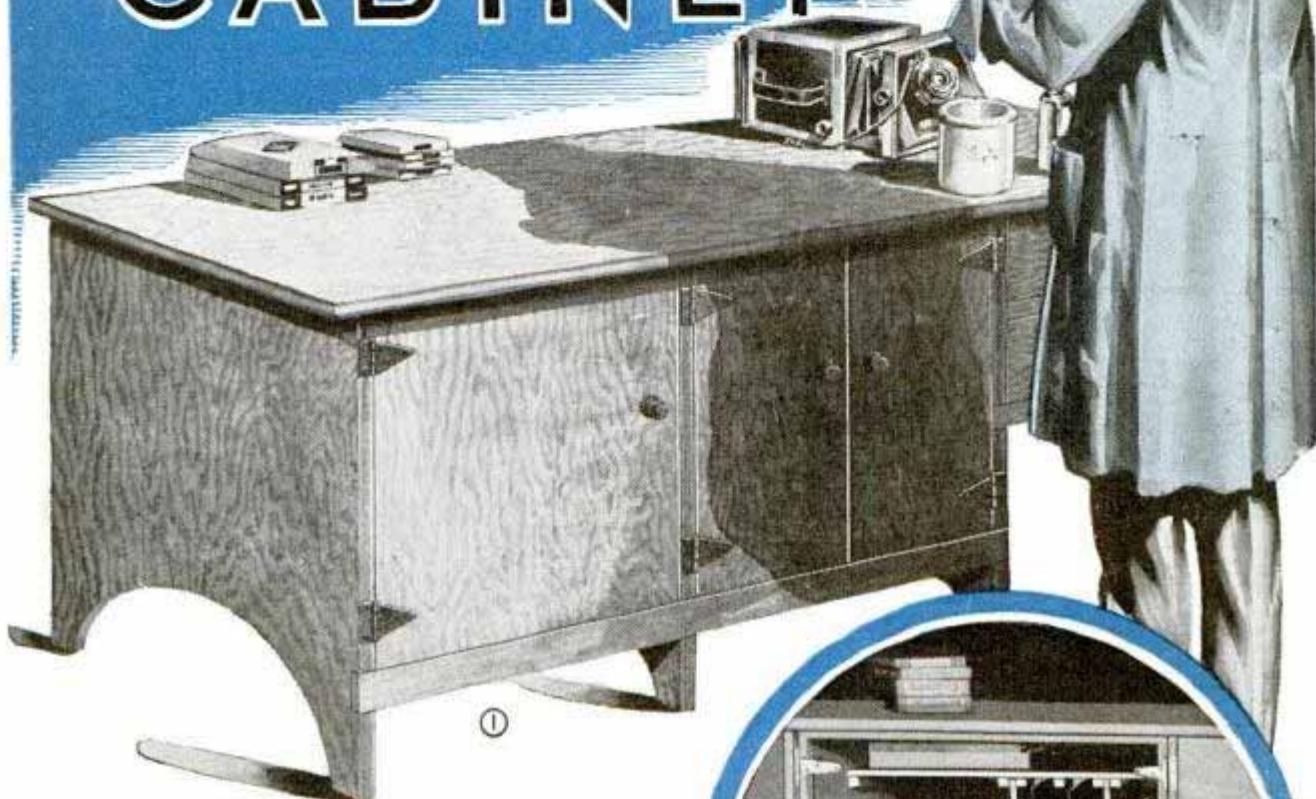
Here is a lung tester that will provide a barrel of fun, and enable you to show the superiority of your lungs over those of your friends. The tester consists of a small phial floating upside down in a $\frac{1}{2}$ -pint flask filled with water. There must be just enough air trapped in the phial to barely float it. A rubber tube is connected to the flask by means of a short glass tube through the stopper. The explanation offered to the uninitiated is that by blowing through the tube he can compress the air



in the phial, force in more water and cause the phial to sink. Anyone attempting this will find his lungs unequal to the task. As a matter of fact, no amount of blowing will have any effect, as the rubber tube is plugged. The only way to sink the phial is to compress the air in it by squeezing the flask in the hands, thereby slightly bending in the sides of the glass. By pretending to blow in the tube and simultaneously squeezing the flask, anyone can sink the phial.—Dale Kelly, New York, N. Y.

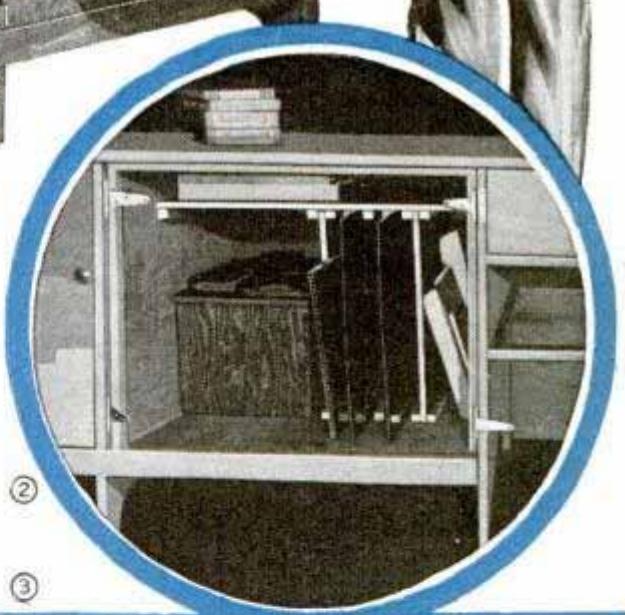
Everything at hand in this

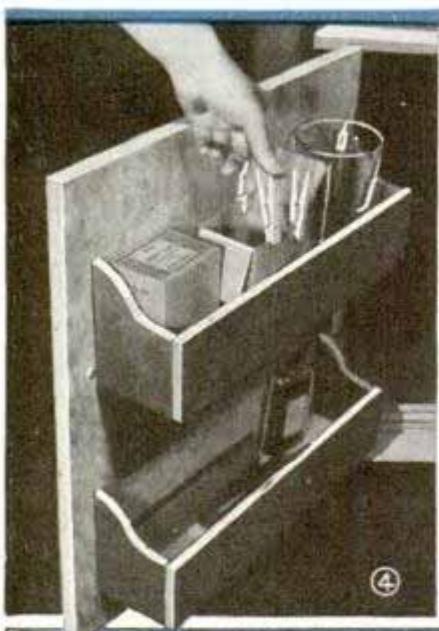
DARKROOM CABINET



By FLOYD MIX

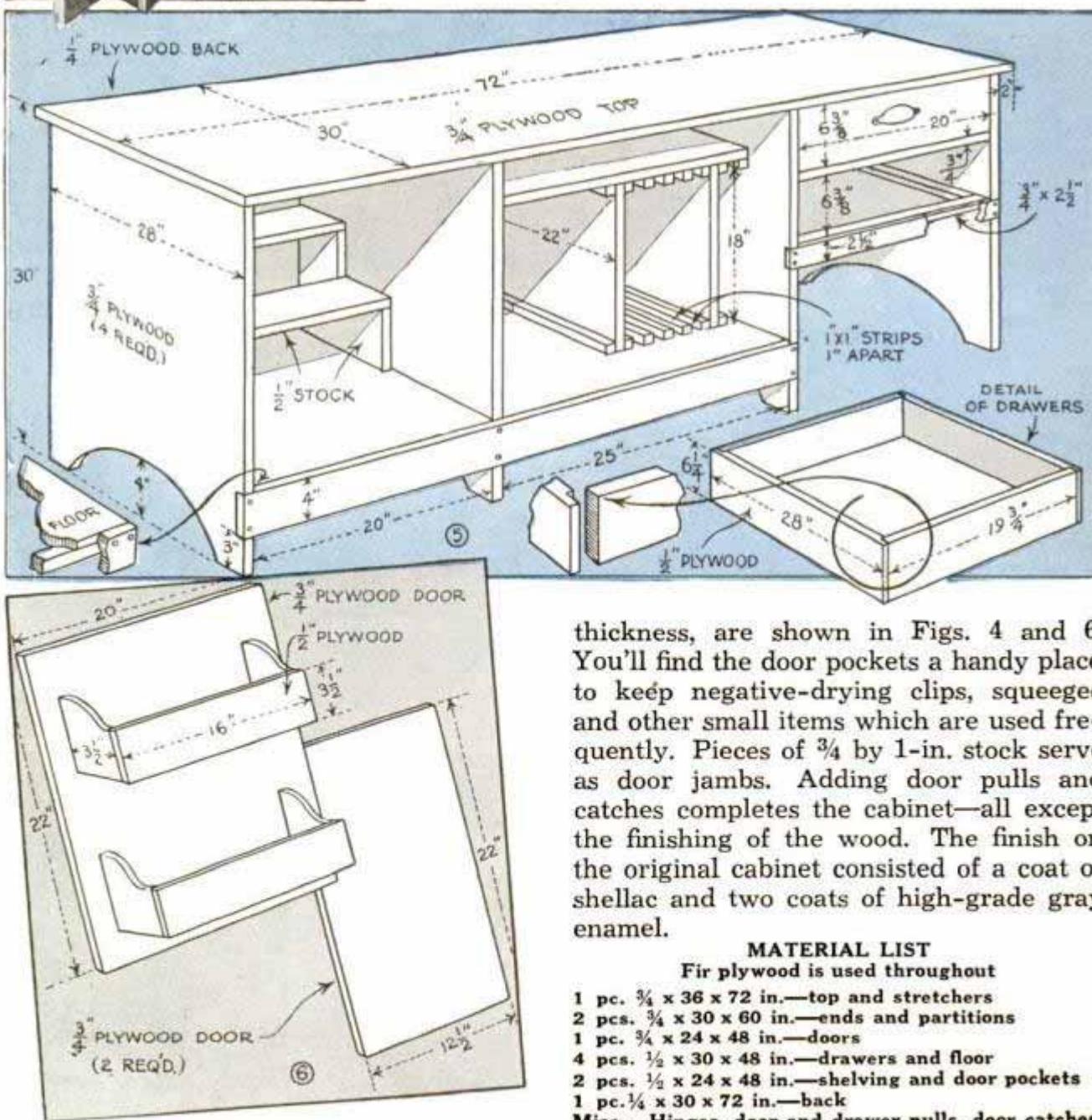
STRUCTURALLY this is one of the simplest cabinets to assemble, for there are no difficult joints to fit. You will notice from the material list, that the whole thing is made of fir plywood. To start construction, the ends and partitions are cut to size, 28 by 30 in., from $\frac{3}{4}$ -in. stock. These pieces are then shaped and floor-supporting cleats are attached as shown in Fig. 5. To keep the ends and partitions in an upright position and evenly spaced from top to bottom while assembly progresses, a couple of 6-ft. lengths of scrap lumber are tacked to each of the side edges. Fitting the top of the cabinet, which is simply a piece of $\frac{3}{4}$ -in. plywood 30 by 72 in. in size, comes next. If the cabinet, Fig. 1, is to receive but little handling, just screw the top securely to the four upright members. Should you desire a cabinet that will stand frequent moving and a great deal of abuse, it





is well to strengthen the joint between the top and the upright members by adding cleats of the type used to support the floor. The cleats should be screwed and bolted to the upright members and the top fastened to the cleats in a similar manner. For the back of the cabinet, $\frac{1}{4}$ -in. plywood is satisfactory, and for the floor, $\frac{1}{2}$ -in. stock is recommended. In putting this on, make sure all joints are tight so the cabinet won't be a "dust trap" when completed. The stretchers and drawer runners are made from $\frac{3}{4}$ -in. plywood and the drawers, including the bottoms, from $\frac{1}{2}$ -in. plywood.

The interior of the two compartments, Figs. 2 and 3, should be arranged to accommodate the equipment you have at hand, care being taken to see that the section for the ferrotyping plates in the center compartment is just the right size to keep the plates in an upright position between the 1 by 1-in. strips. The doors, which are $\frac{3}{4}$ in. in



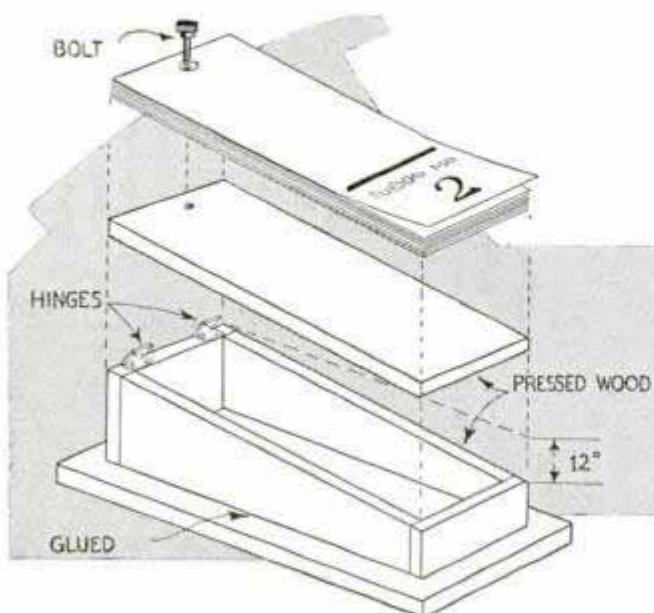
thickness, are shown in Figs. 4 and 6. You'll find the door pockets a handy place to keep negative-drying clips, squeegee and other small items which are used frequently. Pieces of $\frac{3}{4}$ by 1-in. stock serve as door jambs. Adding door pulls and catches completes the cabinet—all except the finishing of the wood. The finish on the original cabinet consisted of a coat of shellac and two coats of high-grade gray enamel.

MATERIAL LIST

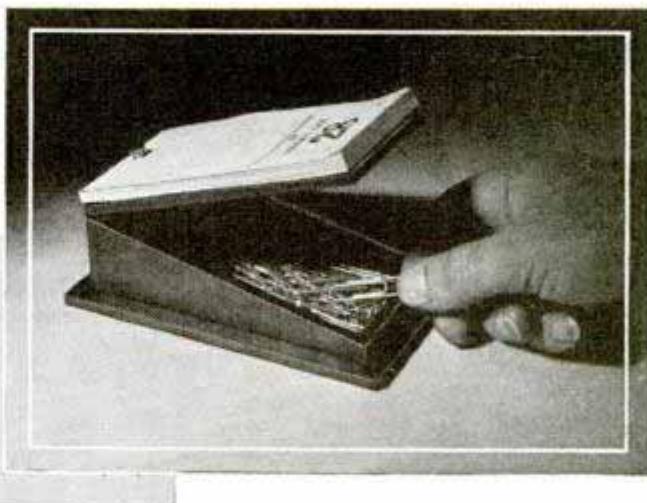
Fir plywood is used throughout

- 1 pc. $\frac{3}{4} \times 36 \times 72$ in.—top and stretchers
- 2 pcs. $\frac{3}{4} \times 30 \times 60$ in.—ends and partitions
- 1 pc. $\frac{3}{4} \times 24 \times 48$ in.—doors
- 4 pcs. $\frac{1}{2} \times 30 \times 48$ in.—drawers and floor
- 2 pcs. $\frac{1}{2} \times 24 \times 48$ in.—shelving and door pockets
- 1 pc. $\frac{1}{4} \times 30 \times 72$ in.—back
- Misc.—Hinges, door and drawer pulls, door catches, 1 pt. shellac, 1 qt. enamel, nails and screws.

Desk Calendar and Paper-Clip Box Combined



Paper clips, rubber bands, and similar items are always at hand in this box, which also holds your calendar and memo pad. The box is of suitable size to accommodate whatever pad you use, and it can be made of thin wood, plywood or hard-pressed



board. Simply glue the four sides to the bottom, then cut them at an angle of about 12°. In hinging the top, hammer the hinge pins lightly to provide sufficient friction to hold the top open. The calendar pad is attached to the top with a small bolt and knurled brass nut as shown.

—Kenneth Murray, Colon, Mich.

Vise Jaws Guide Hacksaw to Slot Screw Head in Center

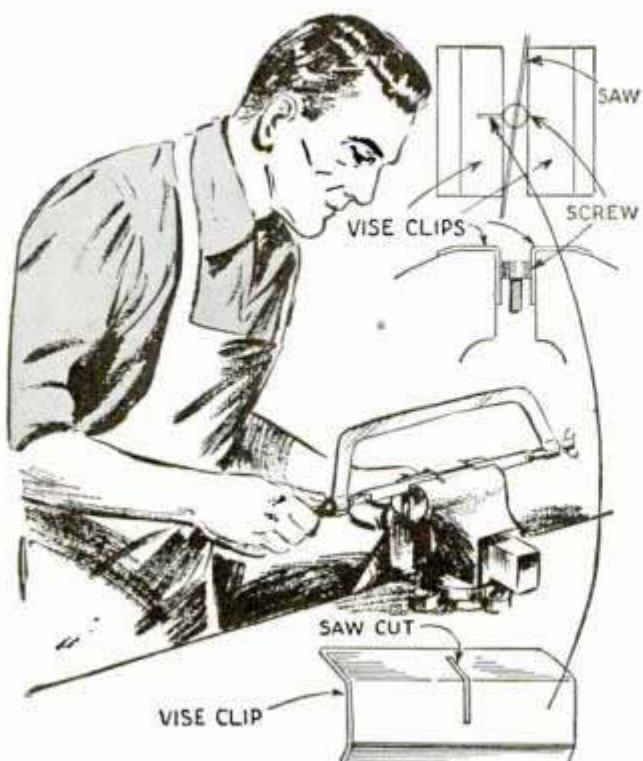
Workmen who occasionally have to make a special screw can assure slotting the head exactly in the center by clamping the screw in a vise and using the jaws to guide the hacksaw blade. In doing this, sheet-

metal clips of the same width as the vise jaws are used, and a slot is cut exactly in the center of one. The slot serves as a guide in locating the screw in the center of the vise jaws. In use, the saw is operated so that the blade just touches the clips at opposite ends as indicated.

Block Fastened to Hammer Head Aids in Pulling Nails

Shaped as shown and screwed to the end of a hammer, a hardwood block is always at hand when pulling nails. The block does not interfere with the regular use of the tool, and enables you to pull a nail in a tight place where it would be exceedingly difficult to place a fulcrum block with the hands.

Edward P. Herlihy, Chicago.



Red Reflectors on Baby Carriage Are Safety Factor at Night



One mother who often took her baby out in its carriage early in the evening, put red reflectors on the carriage so that motorists could see her if she crossed a street. After the reflectors have been put on, the projecting ends of the bolts should be filed flush with the nuts, and two or three layers of tape put over them to avoid damaging the baby's clothing. If possible, countersink the nuts and then tape over them.

Pine-Cone Winter "Gardens"

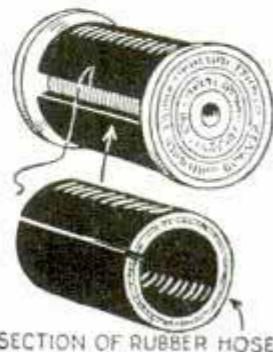


Taking advantage of the habit of pine cones to open when dry and close when damp, you can use them to grow green plants in winter. First sand off the bottoms so that they will set level, or drive a nail through a wood disk into the bottom of each cone.

Then set them in saucers of water and sprinkle grass seeds or seeds of small flowers over them. When the cones close, the seeds will sprout and produce a luxuriant growth that will completely hide the cones.

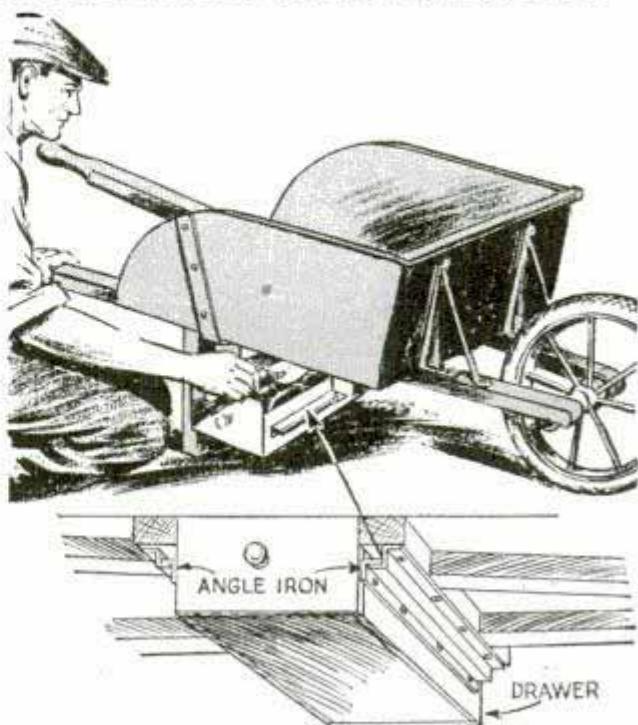
Hose Slipped over Thread Spool to Prevent Tangling

A spool of thread carried in a camp kit may be prevented from unwinding or untangling by slitting one side of a short piece of garden hose and slipping it over the spool in the manner indicated. If you want to hold the end of the thread in position for instant location, cut another slit a short distance through one edge and pull the end of the thread into it.

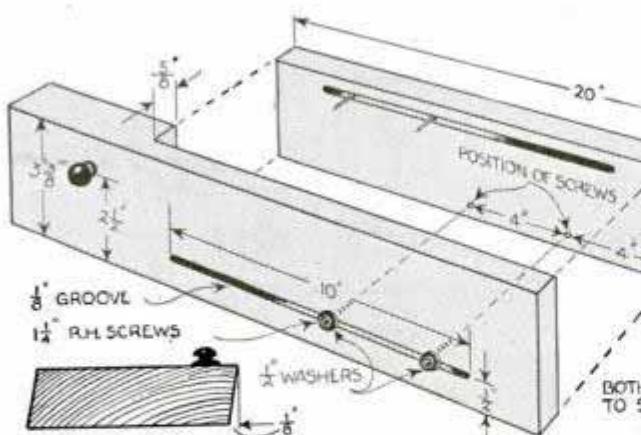


Drawer under Wheelbarrow Stores Hand Tools

When using a wheelbarrow around your home, a drawer fastened to the barrow as indicated provides a place to carry small hand tools that you may need. Lengths of angle iron screwed to the barrow frame and to the sides of the drawer provide strong slides that work easily if greased.



Room Aired Through Window Check Rail



During stormy weather when it is usually necessary to keep windows closed to exclude rain or snow, these adjustable draft stops permit them to be raised so that air enters through the check rails. Also, air entering through the check rails tends to avoid direct drafts on the floor or at head level. Each stop consists of two pieces of wood cut and assembled as shown in the detail. Notice that the upper and lower edges of each piece are beveled slightly to correspond with the bevel of the lower sash member and the slope of the window sill,



thus providing a tight fit at these points to exclude air. Drawer pulls are used on the stops for handholds.

—A. E. Hughes, London, Ontario, Can.

Small Cart to Move Ash Can up Steps Saves Heavy Lifting

Instead of carrying a heavy ash can up basement stairs, take a little time and assemble this simple cart for the job. It con-

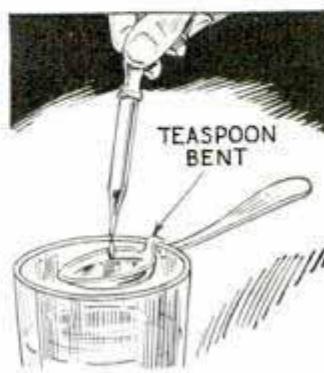


sists of a couple of tricycle wheels, a short, wide board and an old lawnmower handle. A piece of angle iron at the bottom enables you to load the can easily, and a couple of wood blocks on each side of the board keep it from rolling sideways.

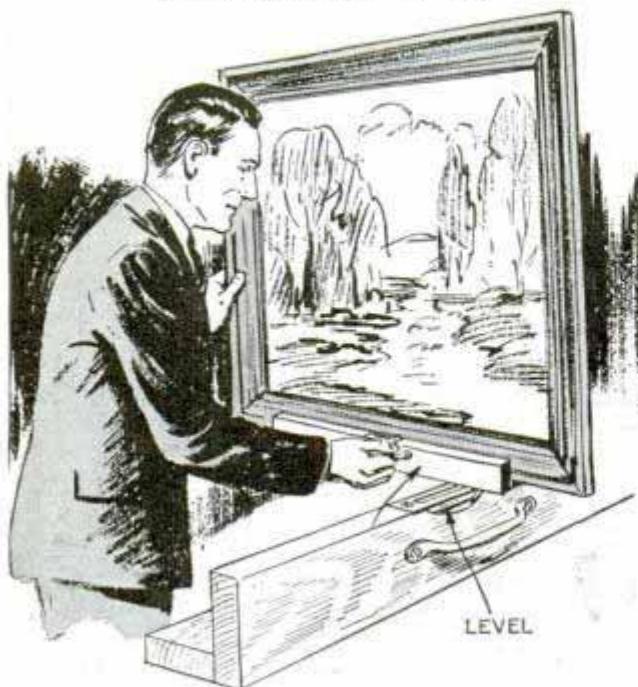
—A. L. Mills, Chicago.

Bent Spoon Hooks over Tumbler for Dispensing Medicine

To hold a spoon steady for mixing or dispensing medicine from a dropper without spilling, use an inexpensive one and bend the handle so that it fits over the rim of a glass tumbler. Also, when a spoon is used in this way, it need not be laid on a table to soil the linen.



Special Level to Hang Pictures Straight on Wall

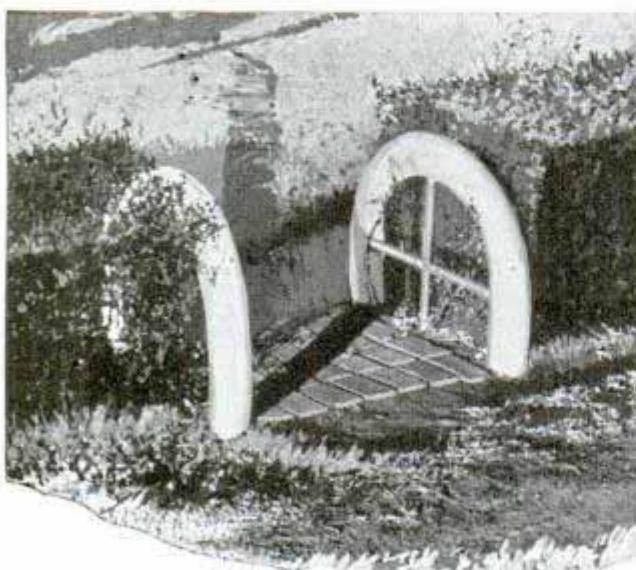


You can save time when hanging large pictures if you use this level. After the picture has been hung, just slip the level under the lower edge and adjust it until straight. Two small boards are nailed together at right angles and a small spirit level is sunk into the top edge of one of them. A drawer handle screwed to the side of the assembly facilitates using it.

—Opie Read, Jr., Chicago.

Gateway Through Lawn Hedge Fitted with Tire Railings

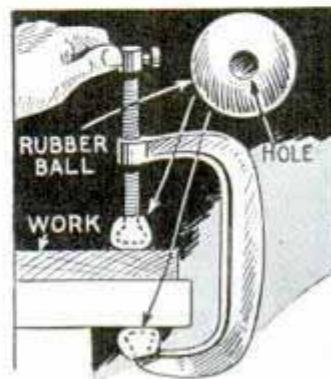
Cut in two at the sides and painted white, two old auto tires were used to make the



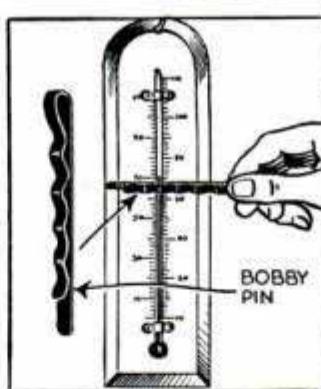
decorative railings on this hedge gateway. The ends of the tires are spread and slipped over the ends of stakes, which support them vertically. Crossed lattice strips fill the open centers of the tires to improve appearance.

C-Clamp Has Removable Pads to Protect Furniture

If C-clamps have to be used on finished work, the surface can be protected by forcing hollow rubber balls of suitable size over the ends of the clamps. The balls will hold themselves firmly in place, and if left on the clamps, will save much time looking for suitable material to put on each side of the work to protect its finish.



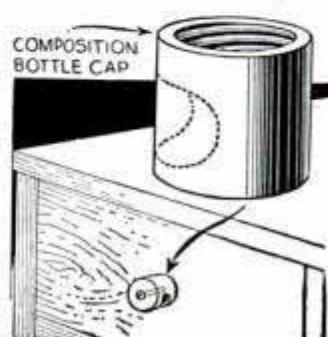
Bobby Pin Marks Readings of Thermometer



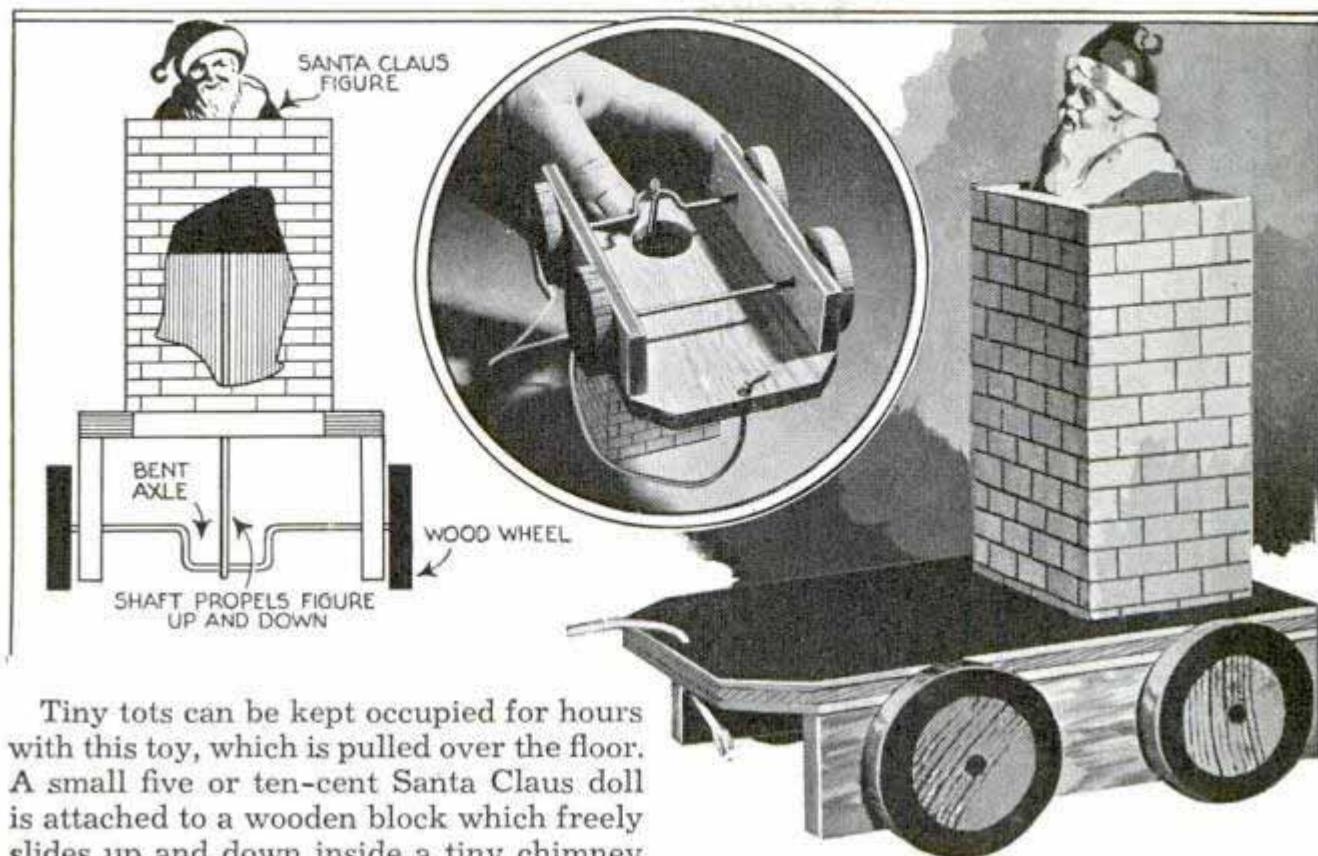
Desiring to mark a temperature reading on a thermometer so that he would not have to remember it when the next reading was taken, one man used a bobby pin as a marker. The pin can be slid along the thermometer tube as desired without removing it.

Bottle Caps Serve as Drawer Pulls

When in need of a drawer pull, one can be made from a composition bottle cap. Cut away part of one side as shown and drill a hole in the top for a screw to attach it to the drawer.



Santa Pops Out of Chimney as Toy Moves



Tiny tots can be kept occupied for hours with this toy, which is pulled over the floor. A small five or ten-cent Santa Claus doll is attached to a wooden block which freely slides up and down inside a tiny chimney mounted on a four-wheeled cart of plywood. Each pair of wheels has a stiff wire axle, the rear one having its center portion bent to a crank shape for attachment of a

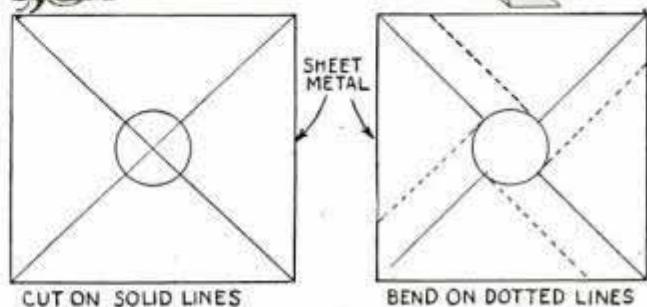
wire connecting rod that activates the piston. A hole is bored in the floor of the cart to provide sufficient clearance for the connecting rod.

Sheet-Metal Stand Will Support Christmas Tree Securely

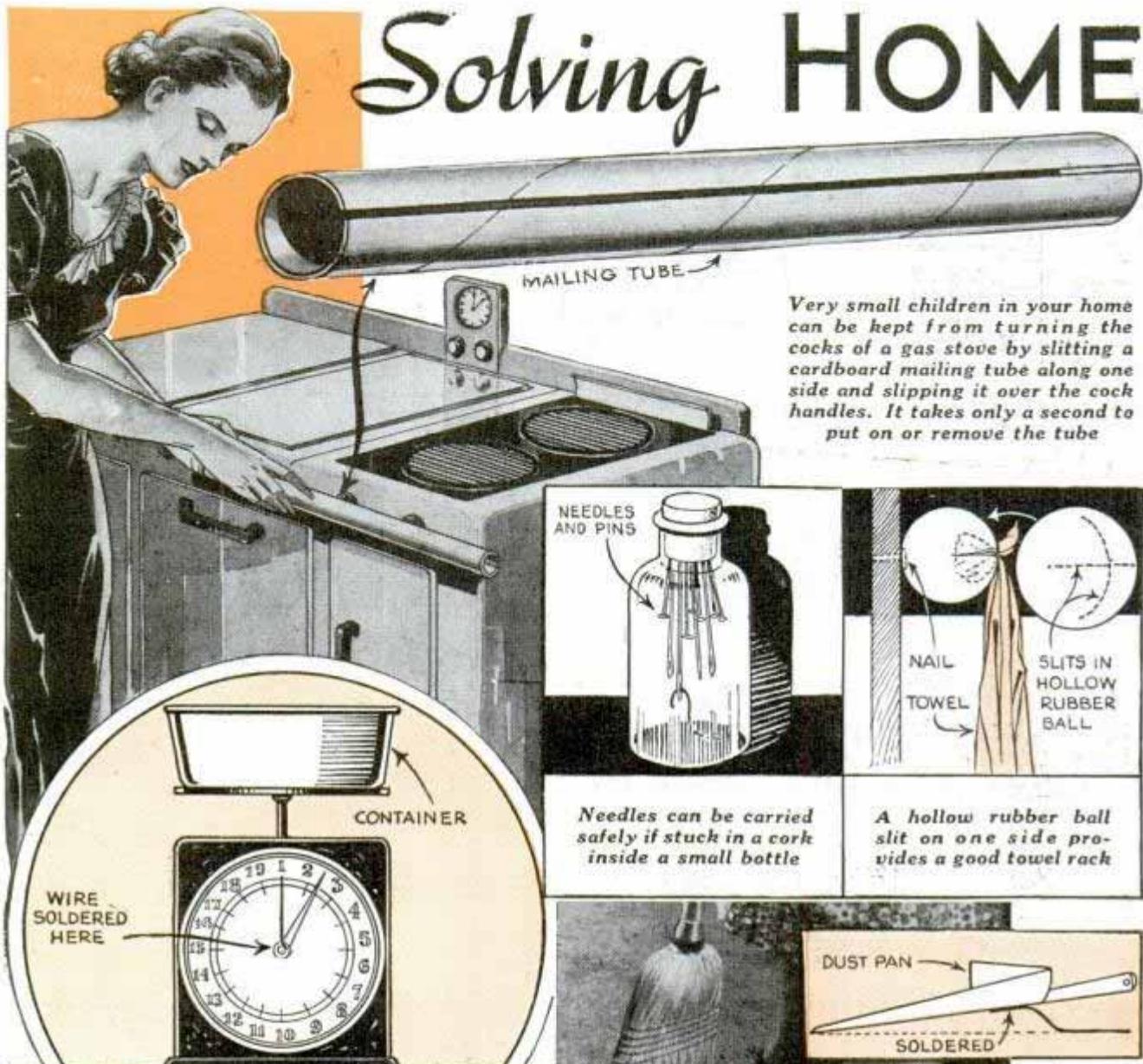
Sturdy and inexpensive, this Christmas-tree stand can be made from a piece of heavy sheet metal 1 or 2 ft. square, depending on the size of the tree. First measure the diameter of the tree at the base and make a circle this size in the center of the square. Then draw lines from each corner of the metal to the center of the circle and cut these lines up to the circle. Then bend each side up at a right angle as shown by the dotted lines. Nails are driven through the center of the base into the end of the tree and also through the vertical pieces of metal into the trunk, which will hold the tree securely. A coat of paint improves the appearance of the stand.

—Bess Livings, Batavia, Ill.

QSmall washable rugs should not be run through a wringer as this is likely to cause them to lose their shape, just hang them on the line dripping wet.



Solving HOME

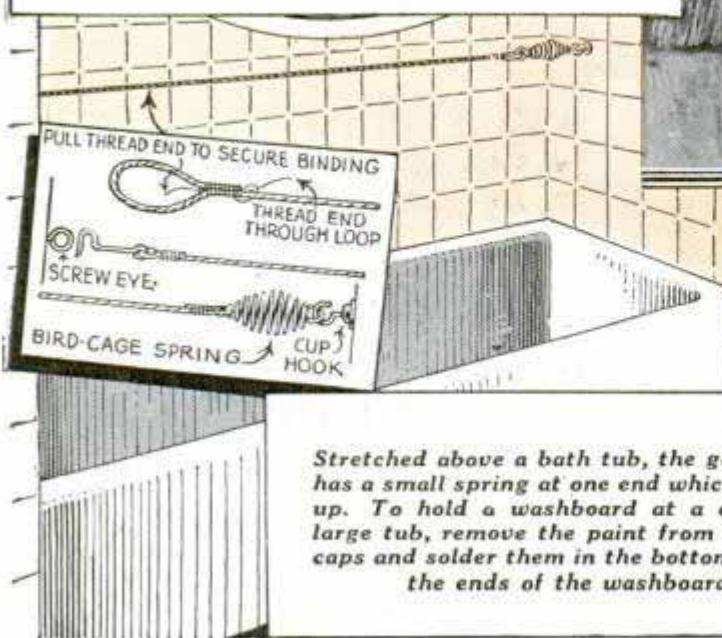


Very small children in your home can be kept from turning the cocks of a gas stove by slitting a cardboard mailing tube along one side and slipping it over the cock handles. It takes only a second to put on or remove the tube

When using the same container to weigh various commodities, a wire soldered to the scale shaft and set at zero allows for the weight of the container

Stretched above a bath tub, the garment line at the left has a small spring at one end which makes it easy to put up. To hold a washboard at a convenient angle in a large tub, remove the paint from a pair of metal bottle caps and solder them in the bottom of the tub. Then set the ends of the washboard legs in them

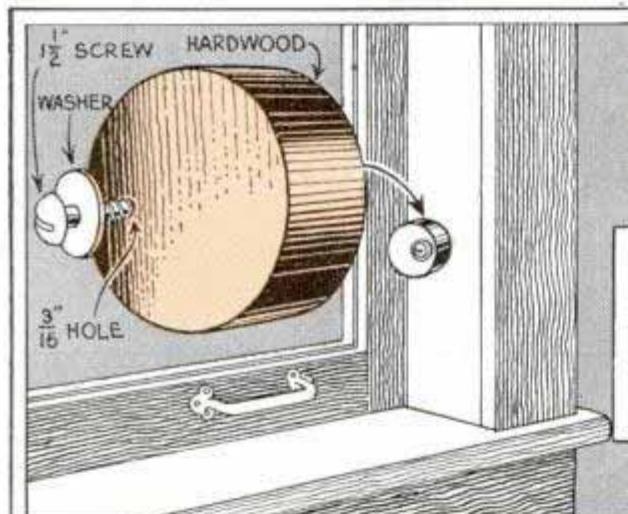
A flat spring soldered to a dustpan enables you to hold it with your foot while sweeping dirt into it



PROBLEMS

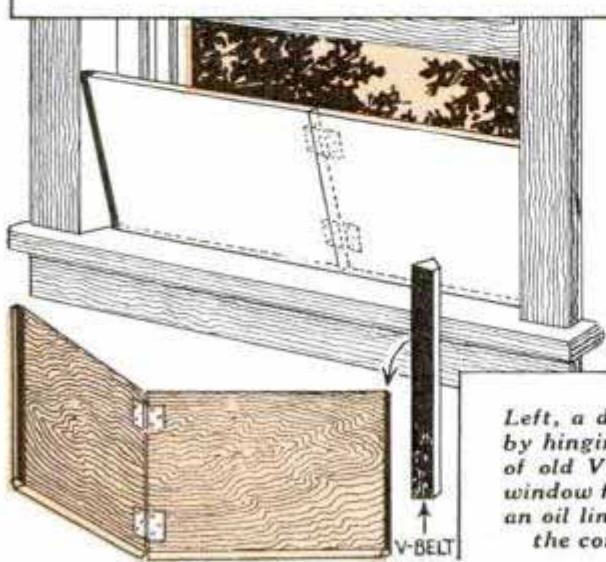


Anyone who has undertaken the job of making a stand or support for a Christmas tree knows that it is not the simple thing it would appear to be. However, an old auto steering wheel is just right. Simply trim the end of the tree trunk with a sharp knife to fit snugly in the wheel hub

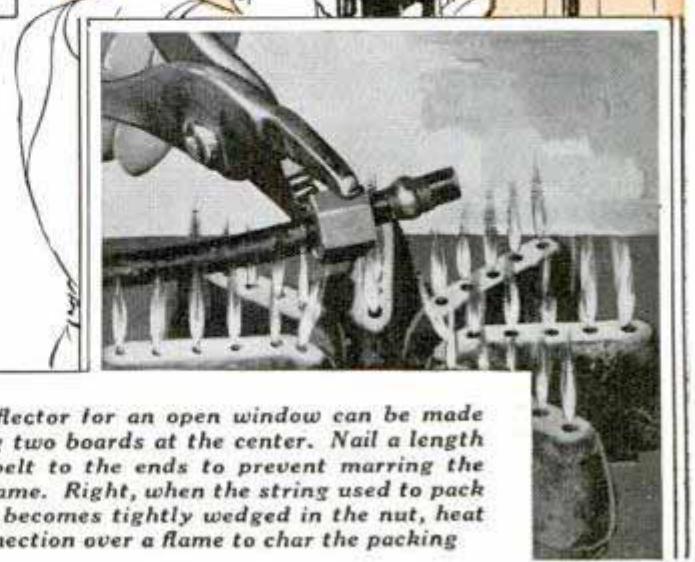


You can easily silence a rattling window or door with a small cam made from a disk of hardwood. The cam is fastened to the frame with an "off-center" screw as indicated

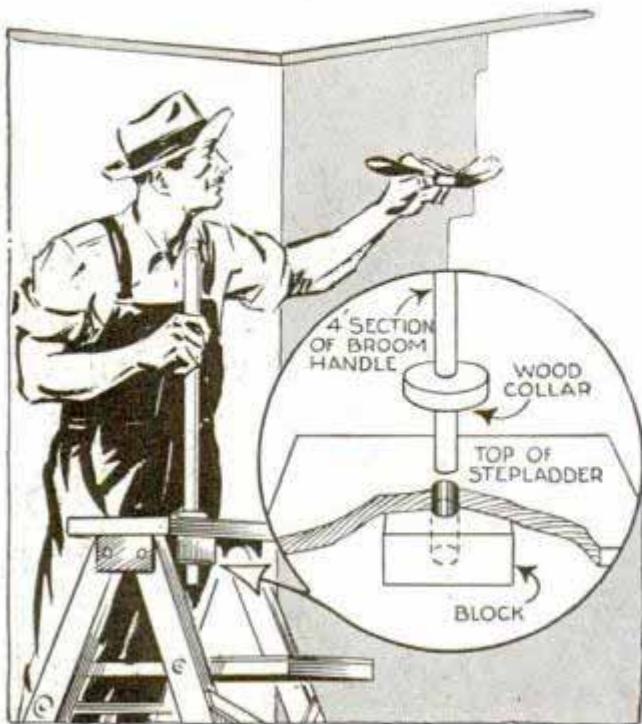
If the plug of your electric razor pulls from the lamp socket too easily, loop the cord and hook it over the socket key as shown at the right



Left, a deflector for an open window can be made by hinging two boards at the center. Nail a length of old V-belt to the ends to prevent marring the window frame. Right, when the string used to pack an oil line becomes tightly wedged in the nut, heat the connection over a flame to char the packing



Balancing Pole on Stepladder Helps Prevent Falls



Women and others who occasionally use a stepladder around the home and are afraid of overbalancing when working from near the top of the ladder will find this pole solves the problem. It is a length

of broom handle with a wood collar near one end, which is inserted through a hole in the top of the ladder, a block being nailed underneath to reinforce it.

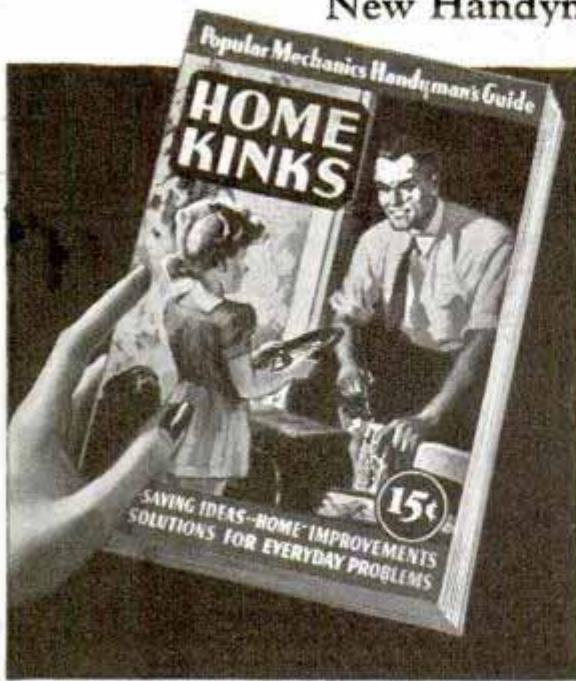
Finger Slit in Hunter's Glove Aids When Shooting

Annoyed by the inconvenience of firing a rifle quickly with a gloved trigger finger, a sportsman cut a slit in the glove finger and turned it inside to leave the index finger of his hand uncovered. As the reversed glove finger rested on the back of the hand, it did not interfere in any way with shooting.



If the juice from an apple pie runs over in the oven while cooking, shake salt on it; this causes the juice to burn to a crisp so that it can be removed.

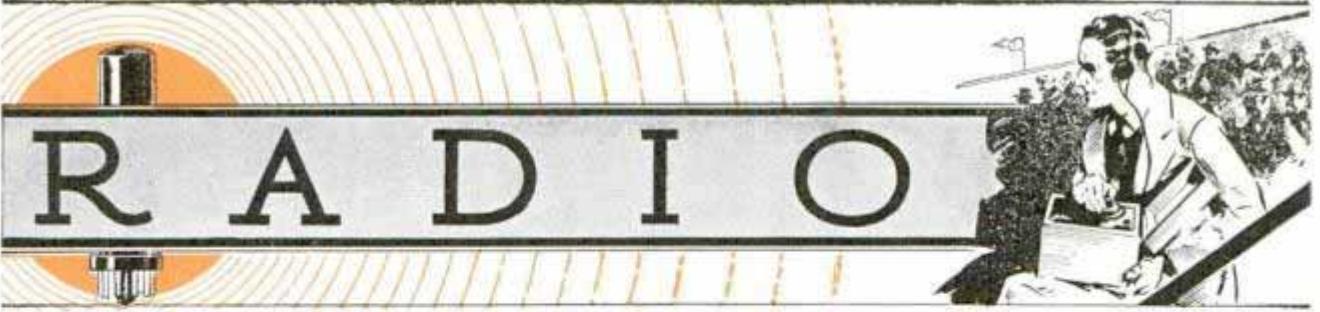
A Hundred Simple Ways to Save Money New Handyman's Reference Guide Shows How!



This 96-page book gives you over a hundred practical ideas of great value in solving, simply and inexpensively, many of the everyday mechanical problems that arise in every home. Also shows many ways of reducing costs and eliminating waste. Contains complete details on refinishing floors and furniture; hanging wall paper; cutting heating losses; curing leaky faucets and making other minor plumbing repairs; protecting clothes, rugs and fabrics against moth damage; curing wet and leaky basements—all this besides numerous shortcuts and simple kinks of great value to make things handier around the average home.

Write for "Home Kinks"—a copy will be sent to you upon receipt of 15 cents.

Popular Mechanics Magazine, Book Dept., 200 East Ontario Street, Chicago, Ill.



"CAMERA-CASE" *Portable Receiver*

ALMOST as easy to carry as a camera or a pair of field glasses, this personal radio for pedestrians plays anywhere, is ideal for hikes and a handy companion at any sporting event. It enables the user to hear the broadcaster's comments while watching the action at a race or game. Completely self-contained, it consists of a 4-tube superheterodyne with a 4-in. permanic-type speaker. A multi-turn non-directional antenna is concealed in the shoulder strap, and the tuning range is from 550 to 1,575 kc. The set is quite sensitive and brings in a wide range of stations with good volume. Within the case, shown in photos Figs. 1 and 2, are two batteries—one 80-volt "B" battery and one 2-cell "A" battery which is claimed to have a useful life of from 75 to 100 hours.

The set is contained in an extremely compact case, covered with imitation leather, 5 by 8½ by 4 in. It weighs less than 5 pounds, and is provided with rubber feet so that it may be placed anywhere.



Isalvia May 6
45-45 Augusta Golod



PROGRESSIVE

By M. N. Beitman

PLANNED especially for students and experimenters, this 4-tube set provides a practical means for learning radio work by "actual doing." In a later article the reader will be told how to convert this very same set to a 6-tube 3-band receiver and use every part originally purchased. This economical feature has been worked out

carefully at the suggestion of prominent teachers for use by progressing radio classes in public-school shops. Both this set and the larger one to follow in an early issue, are complete in every detail, have good tone quality, distance-getting ability and provide excellent radios for the home when completed.

Separate chassis bases are employed for the power supply and the ra-

dio set itself, as detailed in Figs. 1 and 2; the speaker is also a separate unit housed in a standard metal cabinet. The power-supply unit is of standard design for 110-volt, 60-cycle operation. However, transformers for other line-supply voltages and frequencies can be obtained if required. Since a permanent-magnet type speaker is recommended, a separate filter choke and a single dual-eight mfd. electrolytic are

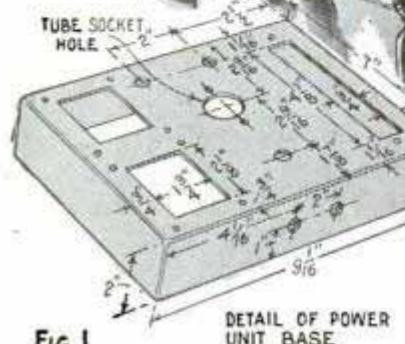


FIG.1

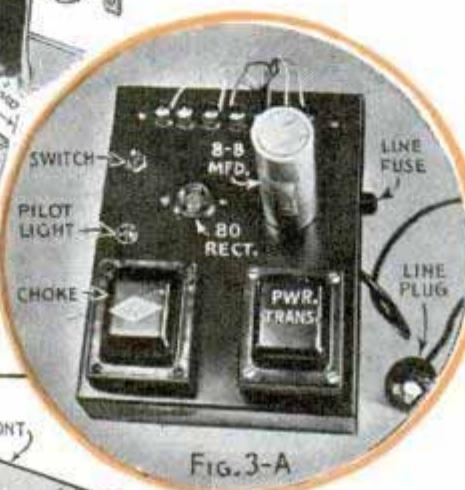


FIG. 3-A

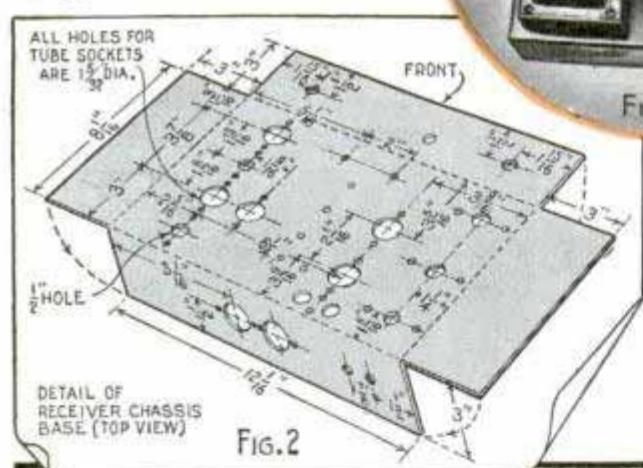


FIG. 2

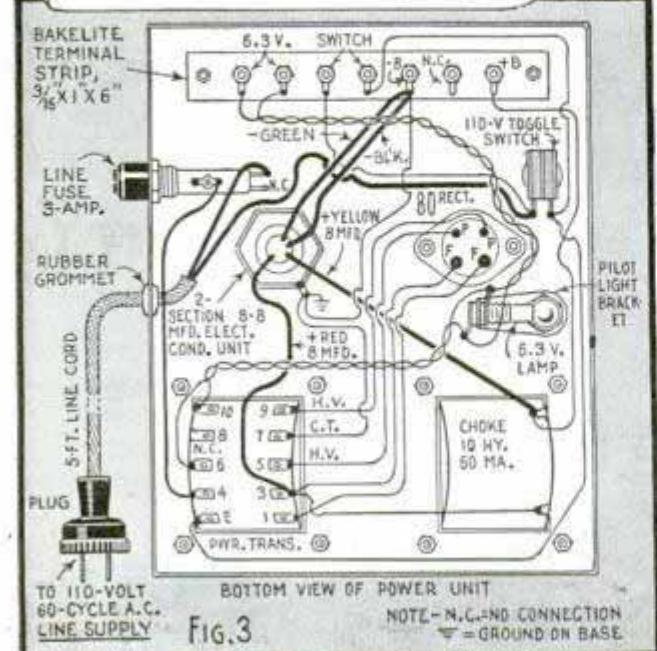


FIG. 3

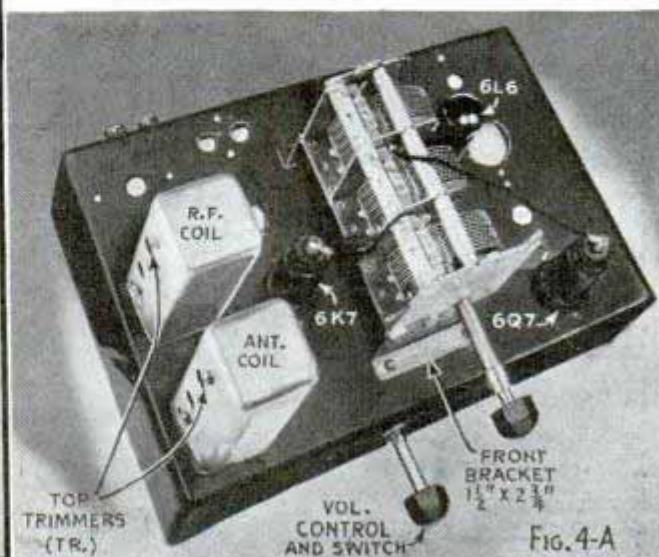


FIG. 4-A

RECEIVER...

for students and experimenters

used in the filter portion. All connections are made to a handy binding-post strip as shown in wiring diagram Fig. 3; a long 6-conductor cable enables the operator to place the power unit under a table when the receiver is in use. This unit is also used for the larger receiver without change. The receiver chassis base is purposely drilled for the additional tubes and parts that will be added when the set is converted into a 6-tube 3-band super.

(Continued to page 137A)

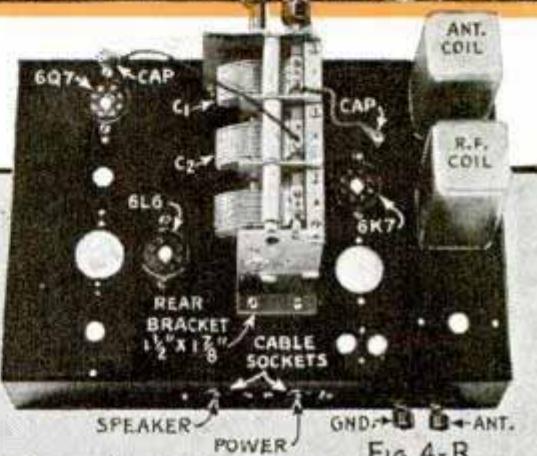
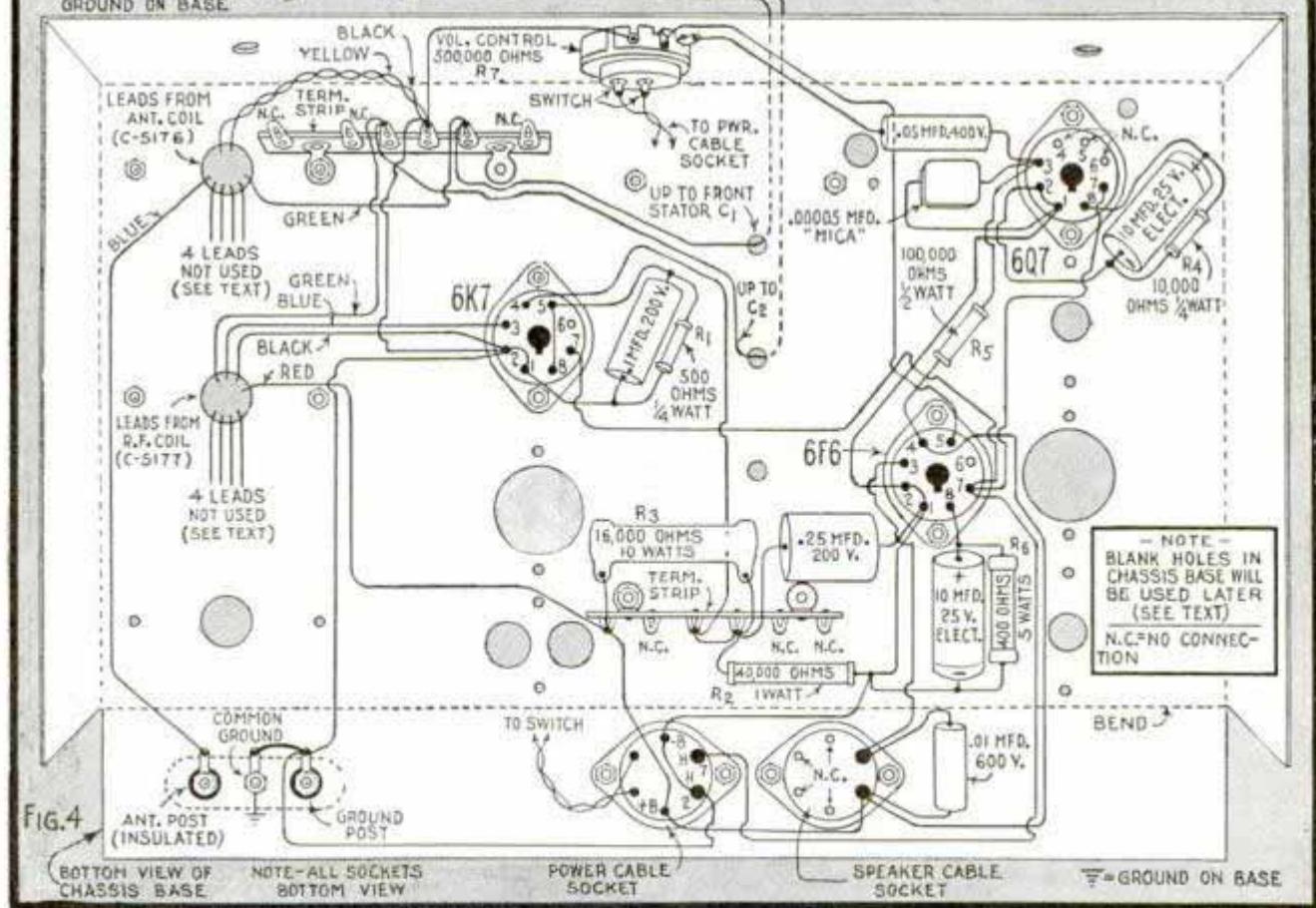


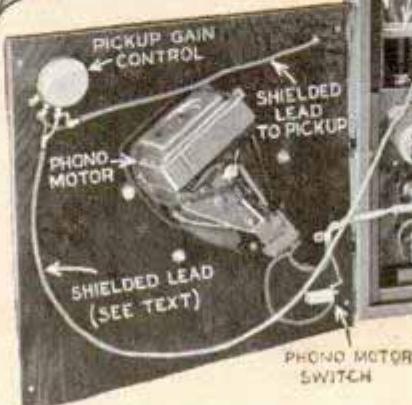
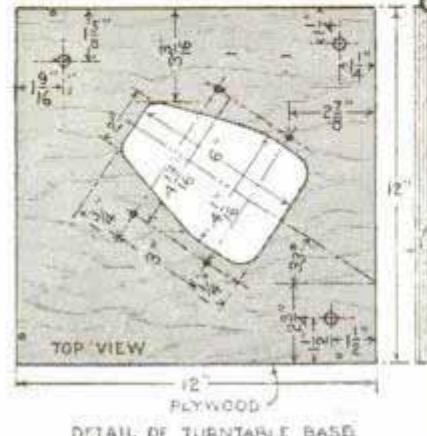
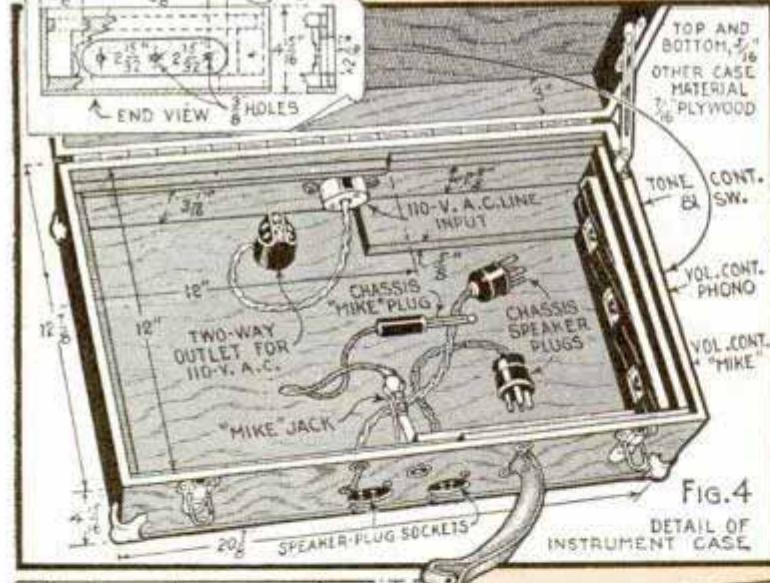
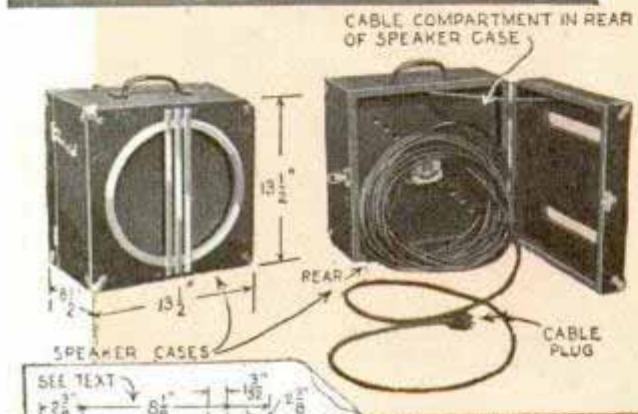
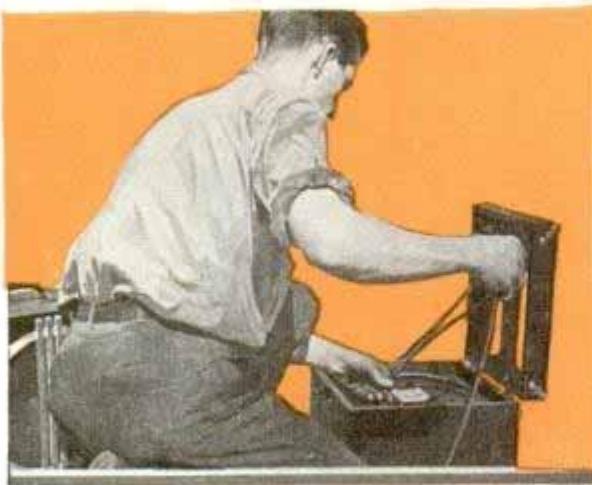
FIG. 4-B



Chassis base flattened out at rear to show all underside wiring and leads running up to the 3-gang variable condenser. See photos Figs. 4-A and 4-B for parts arrangement on top of base

Building a Portable Low-Cost Sound System

PART II

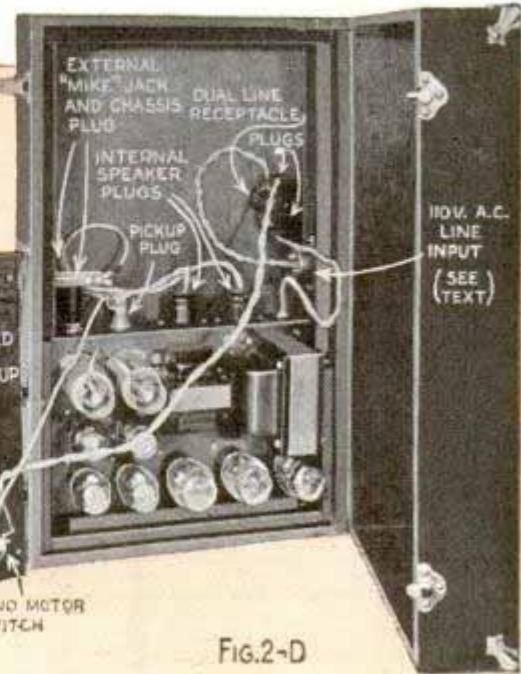


AFTER completing the wiring of the chassis base, as detailed in Fig. 2 in Part I of this article, which appeared in the November issue, we are now ready for the portable case that houses the amplifier, phonograph motor and pickup. It is made of pine wood and is designed so that the amplifier may be operated and controlled with the case closed, if desired.

All case dimensions are clearly shown in Fig. 4. Two $\frac{5}{16}$ -in. pieces are required for the bottom and top of lid; other case material may be $\frac{1}{4}$ -in. plywood. Please note that the chassis base is mounted on $\frac{5}{8}$ -in. strips to raise it to the proper height to center the shafts of the various controls which extend through the cutout in the right end of the case, as shown in photo Fig. 2-E. Details for this recessed end construction are given in the insert sketch that appears in Fig. 4. The shafts of the controls should be cut to the proper length so that the knobs do not extend beyond the end of the case.

Photo Fig. 2-D shows the amplifier unit installed in the case and the various internal speaker and microphone plugs inserted in their respective jacks and sockets. The a.c. supply-line input connec-

(Continued to page 142A)



meesner Mfg Co.
Mr. Carmel, d.l.

Helpful RADIO HINTS

Make your midget broadcast receiver more selective by using a loop instead of the usual 15 or 20-ft. length of "roll-up" antenna wire. With loop detailed in Fig. 1, signals may not be quite as loud but they become directional; when the edge of loop is pointed at the desired station, unwanted signals from stations at right angles to it are eliminated. About 50 feet of "roll-up" type antenna wire is wound on the loop frame, the correct amount being best determined by trial; loop ground connection is optional

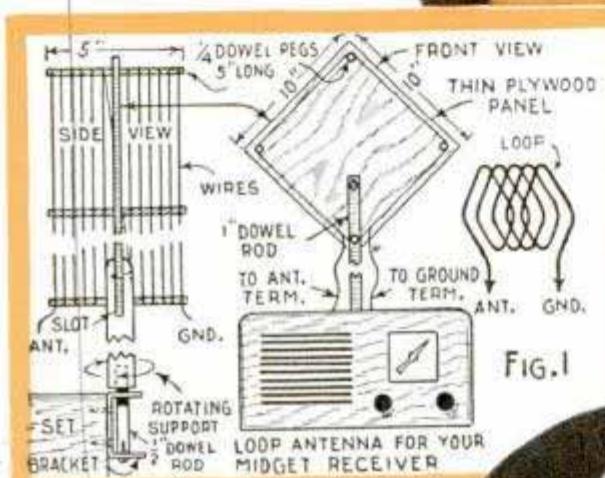


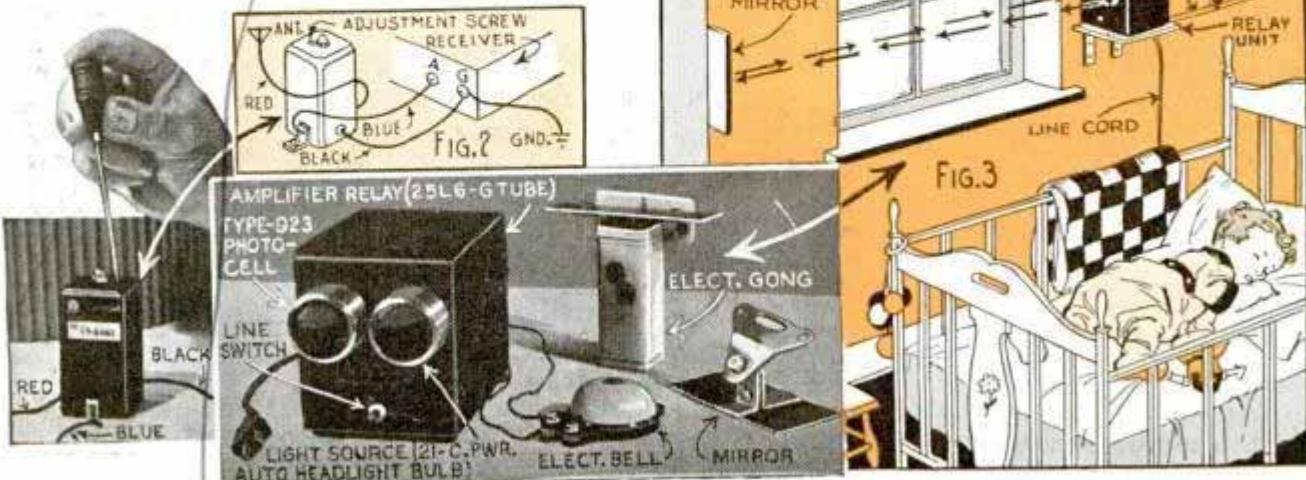
Photo (A), insulated caps for exposed terminals of high-voltage tubes provide protection against accidental shock. Fig. 2, small wave trap available for each of the amateur bands covering respectively 20, 40, 80 and 160 meters to prevent interference with broadcast reception. Two or more units may be connected to the same receiver for eliminating interference on as many different frequencies



FIG. 1

LOOP ANTENNA FOR YOUR MIDGET RECEIVER

Sketch Fig. 3 and photo, illustrate one of several useful applications of a compact easily installed a.c. operated photocell relay burglar alarm now available to experimenters and servicemen. This device consists of a light source, photocell and amplifier all mounted in a compact unit. The light beam is reflected by an adjustable auto-type mirror and is practically invisible; any break in the light beam, over distances up to 30 feet, works the relay that can be connected to operate either a chime, bell or light at a remote point



Camden, N.J.

Junior Sound-Control Studio for Experimenters



Many sound effects commonly employed by broadcasting stations, and recording studios, may be duplicated by means of this electrical kit which allows the youngsters to experiment with home recording and small public-address amplifiers.

Test Set in Panel Assembly

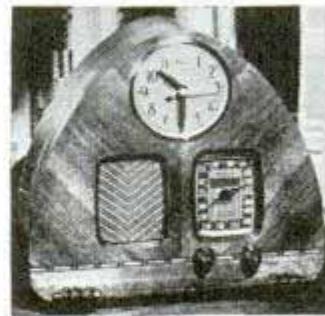
Ready for installation with other radio workbench equipment, this improved rack



and panel assembly has all jacks and controls out in front and immediately accessible to the serviceman.

Electric Clock in Receiver

A five-tube a.c. set with an electric clock and built-in antenna is now available in a small table model 9½ in. high, 10 in. wide and 5½ in. deep. No external ground or antenna is required thus making the set easily portable for room to room use.



"Wireless" Radio-Phono Control

Now you can control remotely either radio or records in a radio-phonograph by means of a small remote-control box without wired connections. Volume and record-changing are included.



Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

NEXT MONTH—How to Build an Inexpensive Metal Locator. A simple, portable beat-frequency instrument of improved design, that anyone can build and operate. **Also—An "A" and "B" Eliminator for Portable Battery Receivers.** This compact unit enables owners of portable battery sets to operate them on 60-cycle a.c. lines.



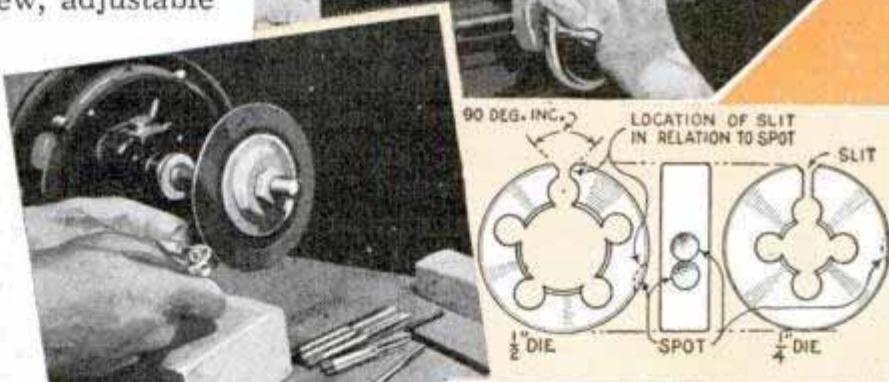
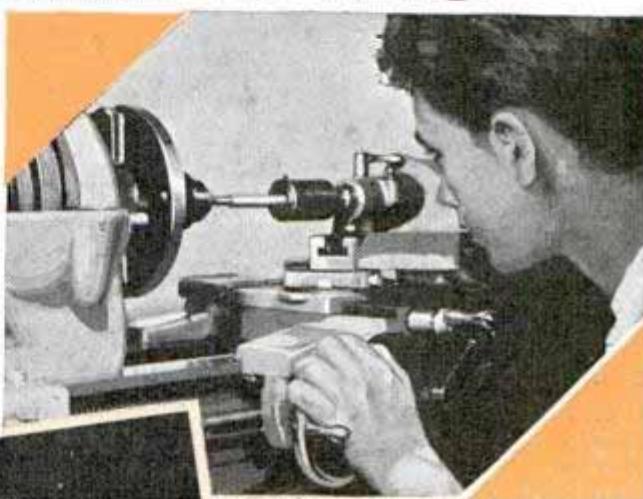
SHOP NOTES

Sharp TAPS and DIES...

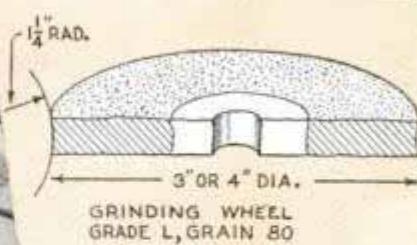
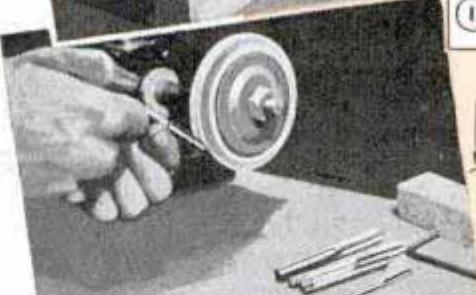
By GEORGE DESCHENES

CONSIDERING the relative size of their cutting edges, taps and dies remove more stock than other metal-cutting tools. The reason for this is that the lead is positive in the case of taps and dies, whereas with a drill or reamer the feed is almost completely controlled by the operator. With such limitations in view, adjustable dies are preferable to non-adjustable ones, especially in cases where it is necessary to cut a thread slightly under or over size.

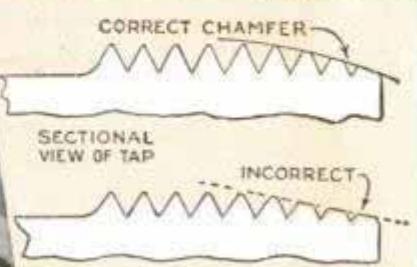
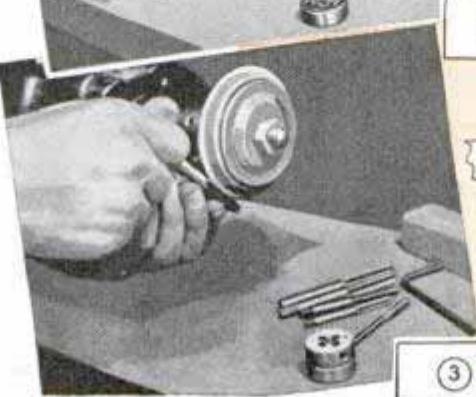
If adjustable dies are not available, but you do have one or more sets of non-adjustable dies, it is possible to alter these, this being recommended for dies of the cheaper variety. To make a die adjustable, it is first slit with a cutoff grinding wheel that has a $\frac{1}{16}$ -in. thickness, as illustrated in Fig. 1. The location of the slit in relation to the spot on the periphery of the die depends on whether the die has four or five cutting surfaces. The next step is to grind the 90-degree compound angle by holding the die with the slit at about a 45-degree angle against a wheel with a sharp corner. Also, make it a habit



① Slitting the die

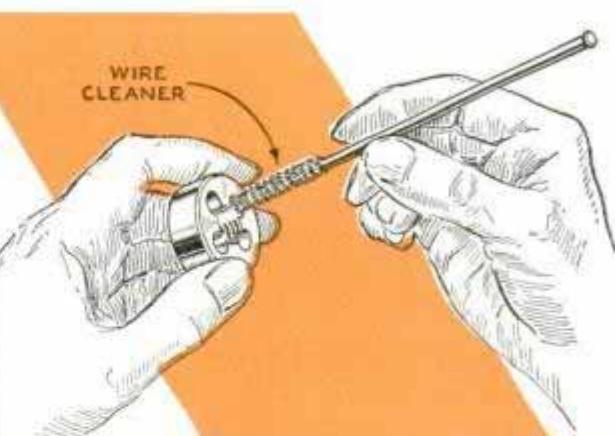
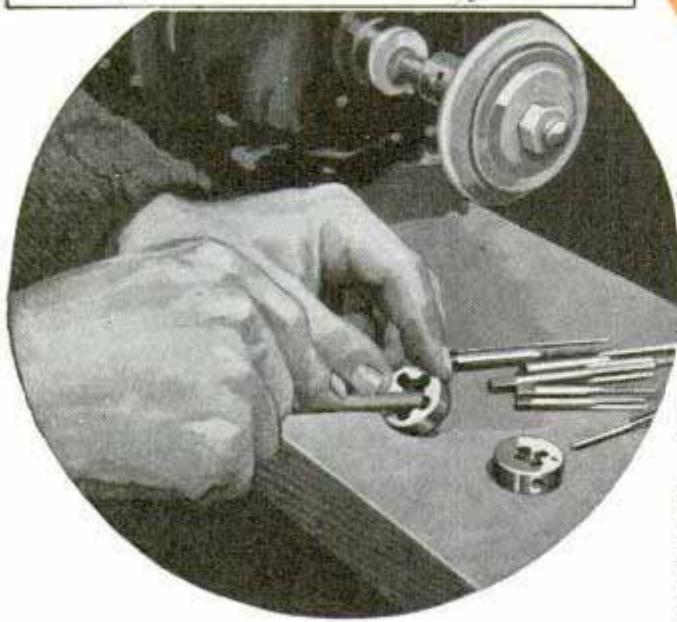


② Chamfering tap



③ Grinding flutes

(4) Hone with round slipstone



(5) Clean dies before using

to touch up the chamfers of your dies with a small round oilstone, as in Fig. 4. Do this often and see how much better they will cut. Before using dies, always be sure to clean them with a wire brush as in Fig. 5. When using dies in a lathe, it is best to provide a special holder that fits the tailstock and seats the dies securely and accurately. This is much better than holding the dies against a tailstock pad.

Chamfers are the chief point of attention on taps. Chamfers must be kept to their original outline as much as possible. This is best done, without special equipment, as shown in Fig. 2, using a grinding wheel of

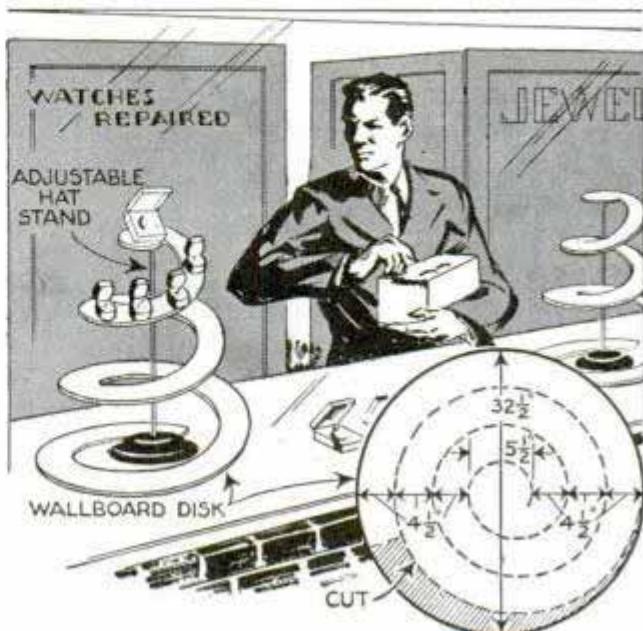
the size given. An equal amount of stock is removed from each chamfer by feeding to the wheel with a slight oscillating movement and in such position that the required clearance will result. With a little practice on discarded taps, you soon will become proficient in getting an outline as that shown in Fig. 3. Occasionally, you should also grind the flutes of all taps by starting at the back rather than at the front. The wheel used should be of the same size as the one shown in Fig. 2, with the face dressed to the exact contour of the flutes. Apply light pressure, traversing down and up, and be careful not to round the cutting edges. The conventional bench grinder is best adapted to this work. A 3-in. wheel at 3,450 r.p.m. has the same surface speed as a 6-in. wheel at 1,750 r.p.m. The smaller diameter wheel is usually best.

Spiral Rack of Wallboard Displays Small Jewelry Boxes

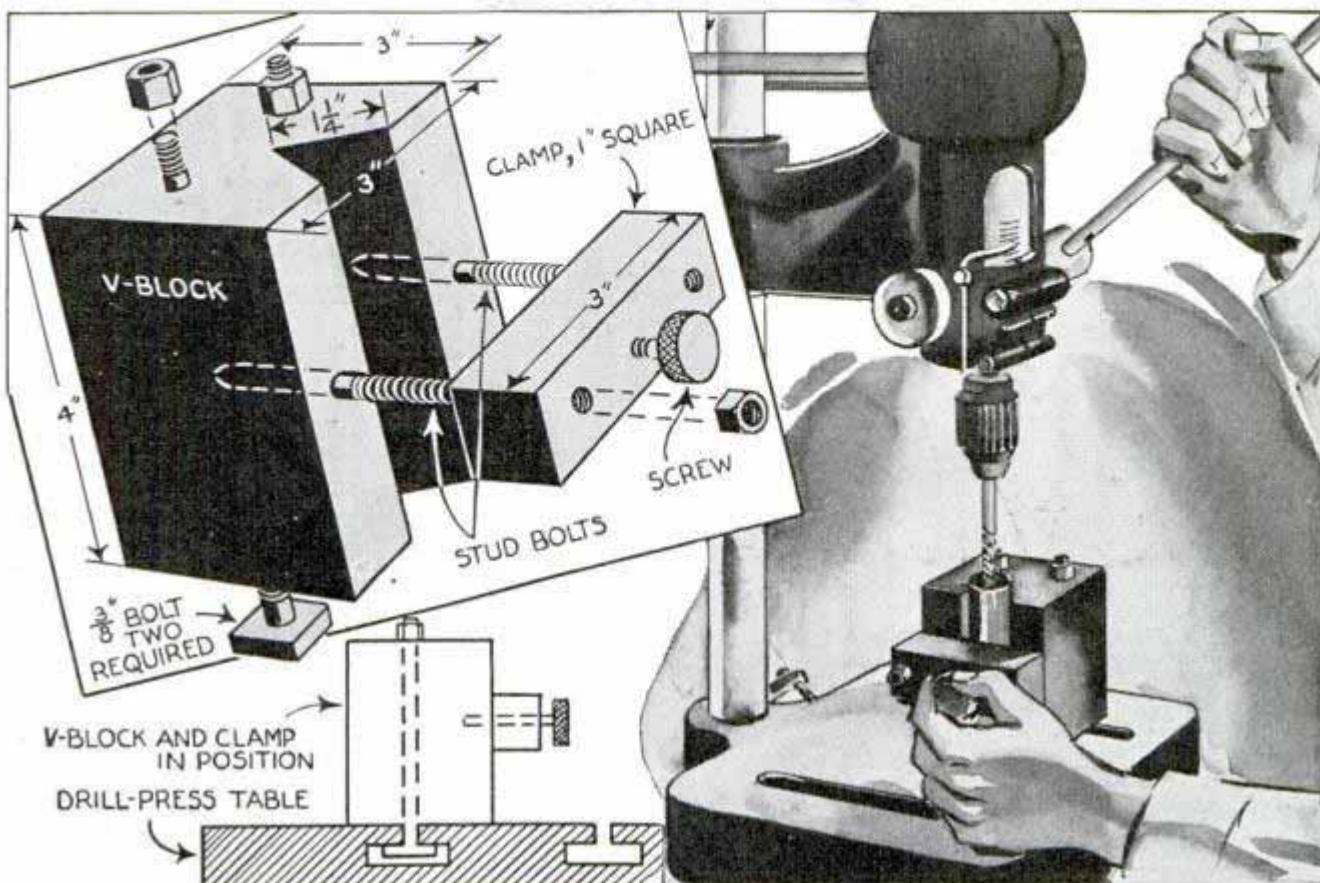
Jigsawed on a spiral line, a single disk of wallboard can be telescoped to form a novel rack on which small items of merchandise, such as jewelry boxes, can be displayed attractively. The disk is supported on a metal hat stand, adjusted for proper height and placed up through the center of the spiral.

Lathe Centers from Drills

Broken taper-shank drills can be ground easily to provide good lathe centers in less time than they can be made from rough stock. Just put the drill in one of the lathe-center holes and grind it to shape, taking care, of course, not to heat it and anneal the metal.



V-Block Holds Round Work to Drill the Ends



Drilling holes in the ends of short rods, pins, bushings, etc., is simplified with this V-block. Long, slender bolts passing through the block fit into slots of the drill-press table and hold it securely in place. A clamping bar holds work in the V-groove of the block, the bar being secured by stud

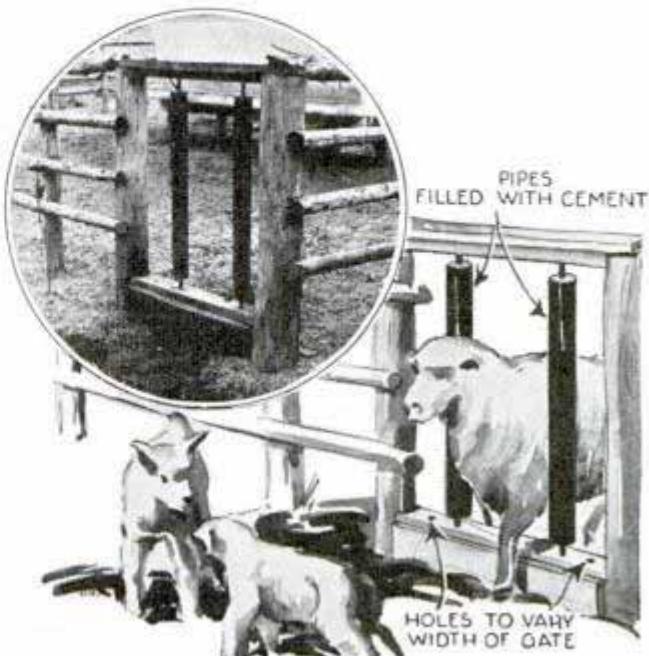
bolts driven into holes tapped on each side of the groove. When the work to be drilled is smaller in diameter than the depth of the V-groove in the block, it can be held by means of a thumbscrew tapped in the center of the clamp bar.

—Truman Greenwalt, Litchfield, Ill.

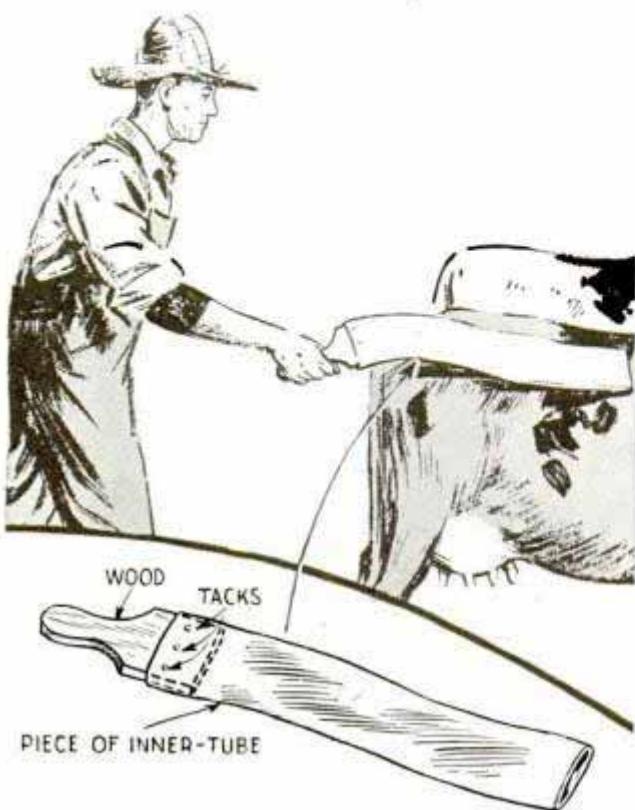
This Roller Gate Is Adjustable to Pass Various Animals

Desiring a gate that could be adjusted to let animals of various sizes pass, and keep out others, a farmer made the one shown. It consists of two vertical rollers mounted on cross members between two posts. Both members are drilled to vary the spacing of the rollers, the upper member being removable to make the adjustment. The rollers are lengths of pipe filled with concrete, the shafts that project from the ends being centered in them before pouring the concrete.

An easy way to remove grease spots on wallpaper is to cover the spot with a paste made of cornstarch and water. When dry, brush off, and the stain in most cases will be gone.

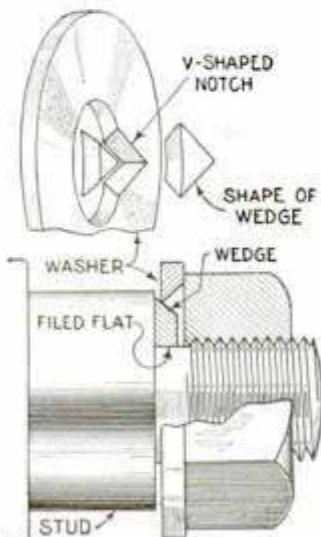


Humane Whip to Drive Cattle Has Loud Report



To avoid injuring or bruising livestock in his shipping yards, one Wisconsin stock buyer insists that all driving be done with whips made of inner tubes. The tube sections are mounted on board handles, cut as indicated, and are tacked in place to seal the end of the tube. When the whip is slapped against an animal it makes a loud report that startles the beast and produces the same effect as a painful blow. The closest investigation of slaughtered animals has shown no bruise or injury.

Locking Nut on Pulley Shaft

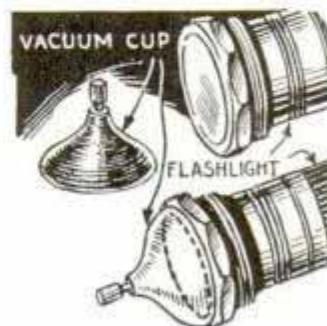


A nut that repeatedly worked loose on the end of an idler-pulley shaft was locked tightly in place as indicated. A V-shaped piece was cut out of the washer under the nut, holding the hack saw at an angle to bevel the edges. Then a flat was filed on the

shaft close to the shoulder. When the washer was placed with the narrow side of the notch against the shoulder, the wedge slipped in between the shoulder and washer. Tightening the nut forced the wedge against the flat portion of the shaft and locked the assembly.

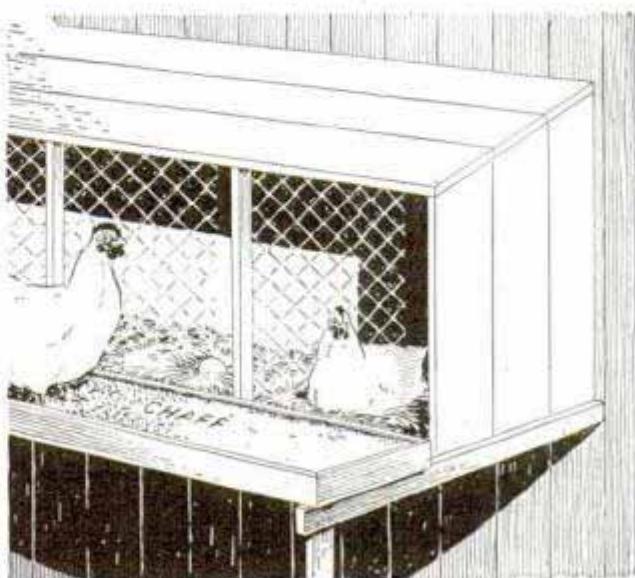
Lens of Flashlight Protected by Vacuum Cup

Finding that the lens of a flashlight carried in his tool bag was damaged by metal articles, a mechanic slipped a small vacuum cup over the lens before placing the light in the bag with other tools. The removal and replacement of the cup take only a second.

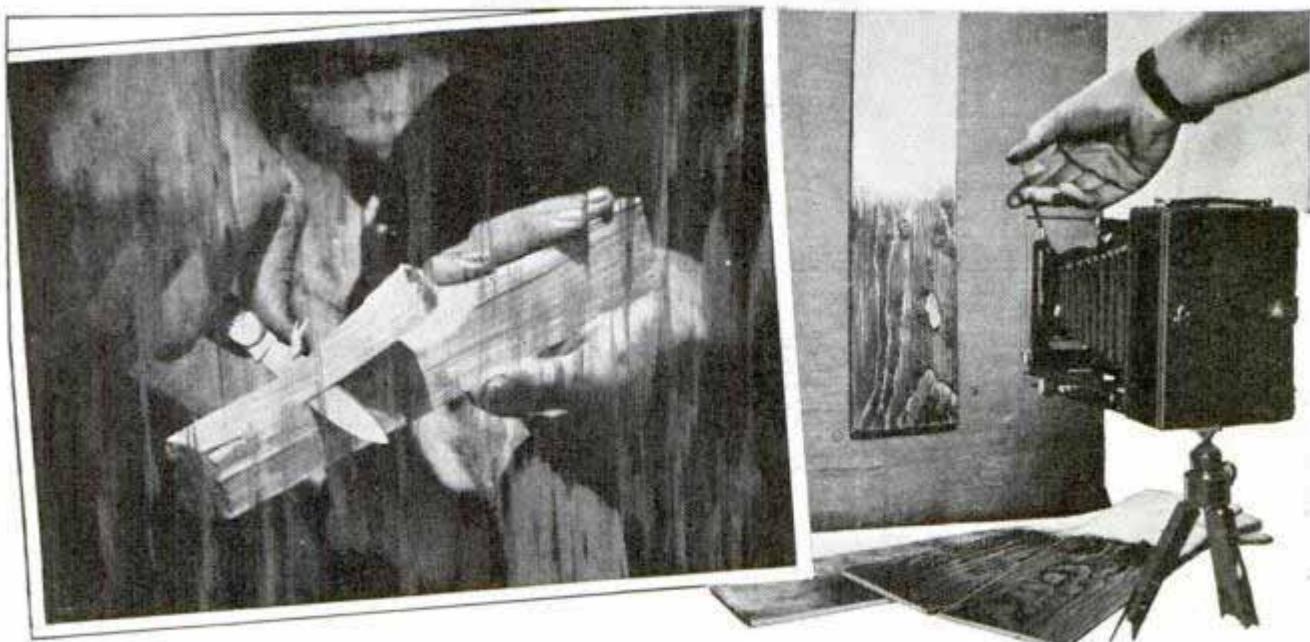


Chaff Trough at Hens' Nest Prevents Soiling Eggs

Hens tracking mud into their nests during rainy weather cause considerable loss of revenue for the owner, as once the eggs are soiled it is difficult to clean them to bring top prices. To prevent this as far as possible, one poultryman places a shallow trough in front of the nest and fills it with chaff or sawdust. This helps to clean the feet of the fowls. Also, the chaff clings to the mud not removed from hens' feet and prevents it from marking the eggs.



Novel Backgrounds Superimposed on Prints



A texture negative under the picture negative in the printer—that's what turns the trick in this process. Using texture negatives from such surfaces as leather, wood, stone, lace, a frosty window or a leaf, you can turn out some very striking contact prints or enlargements for your album. Above, you see the results. This example was made by simply photographing a stained-wood surface, and is particularly

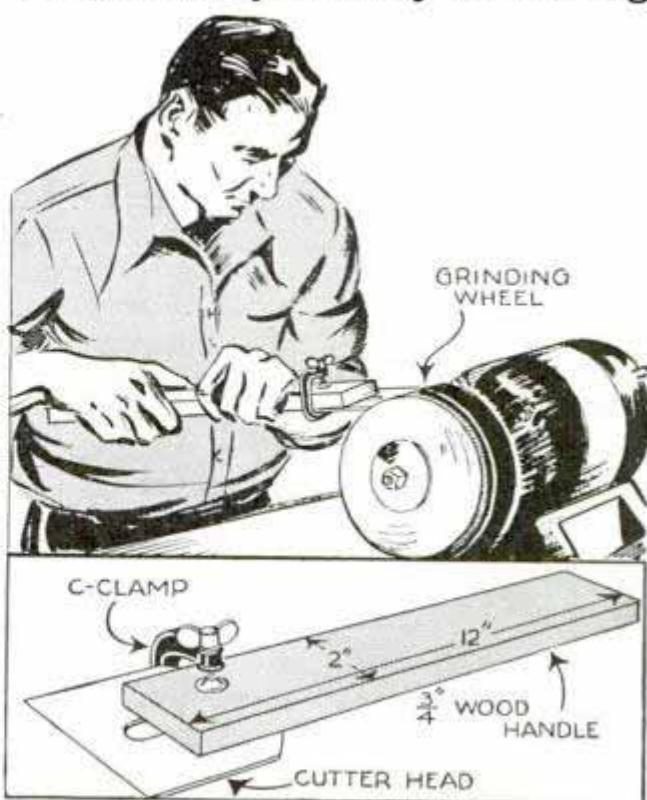
suitable for a photo of whittling. The texture negative should not be hard or contrasty. A thin one is better. It is well to make texture negatives of several different surfaces so that you can control the process and also select a suitable texture. In contact printing, the texture negative is placed beneath the picture negative, while in projection printing the two negatives are placed in the holder face to face.

Small Cutting Tools Clamped to Handle for Easy Grinding

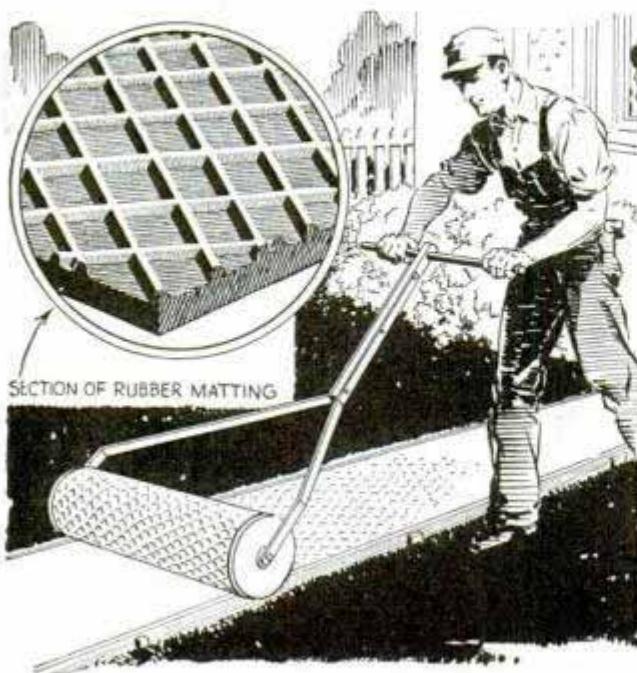
Small cutting blades, such as spoke-shaves, plane irons and scrapers are so difficult to grip while sharpening them that it is almost impossible to obtain a correct edge. Also, there is always danger of injuring the hands when holding the blades against a grinding wheel. To avoid this trouble, fasten the blades to a piece of wood with a C-clamp to provide a handle on which you can get a good grip for holding the blades at the angle desired. The thumbscrew of the clamp should be placed uppermost so that it will not interfere if you support the tool on a rest, and the blade should be clamped to the underside of the handle.

—A. F. Lantz, Bramber, Nova Scotia, Can.

To clean dry floor mops, first soak them in warm water to which a generous amount of salt has been added, then wash them in warm, soapy water and rinse well.

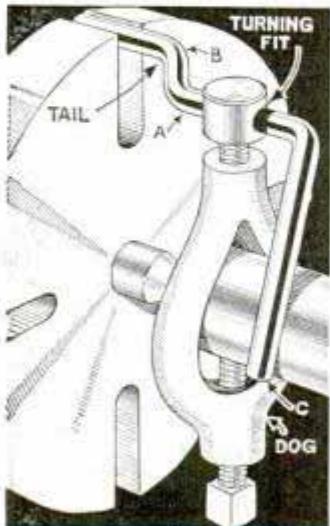


Sloping Sidewalks "Treaded" to Provide Safe Footing



One contractor who specialized in laying sidewalks and often had to build them on sloping ground always roughened the surfaces to provide a safer footing for those who used them. To do this, he used a wood roller covered with rubber matting, which was run over the concrete while it was soft. This left an impression of the matting in the concrete. Matting with almost any design will do. If the concrete has a tendency to adhere to the rubber, coating it with cylinder oil at frequent intervals will prevent this trouble.

Reversible Lathe Dog Saves Time



Time can be saved by using this dog when facing work to length or doing other short jobs on the ends of bars, as it does not have to be removed each time the work is turned end for end. Just slide it along the work and reverse the tail. The dog consists of a regular lathe dog with the tail cut off and the end tapped for a large cap screw, the head of which is

drilled to take the new tail. This is made from a steel rod bent as shown, the bends A and B being made after the rod has been pushed into the screw head. To reverse the tail, just lift it at C and turn it over.

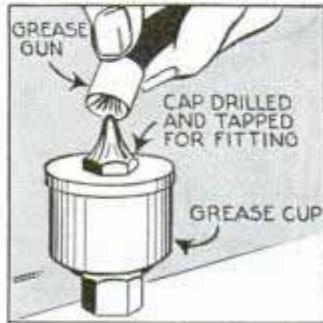
—H. Moore, Leeds, England.

Compression Cups Are Adapted to Use Pressure Gun

Machines and farm implements that are equipped with compression grease cups can be lubricated with a pressure gun by simply providing each cup with a grease fitting.

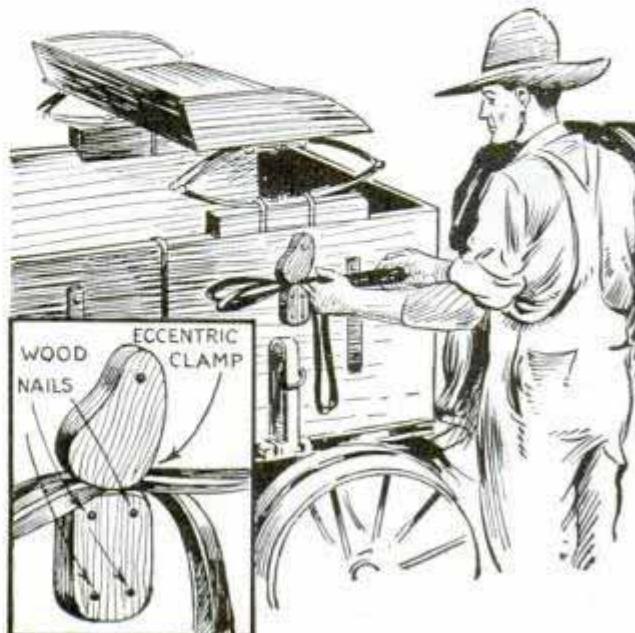
After each cap has been screwed down tightly, a grease gun can be used in the regular way.

—D. E. Wyatt, Richfield, N. C.



Clamp on Wagon Grips Reins When Team Is Unattended

When using a team and wagon on jobs where the reins must be released temporarily at times, one farmer uses an eccentric clamp on the side of the wagon box to hold them. The clamp is made from a couple of wood blocks as indicated and keeps the reins where they are handy to reach. Furthermore, the eccentric action makes it easy to attach or remove the reins.



the tail cut off and the end tapped for a large cap screw, the head of which is

LIGHTED CASE *displays your MODEL*

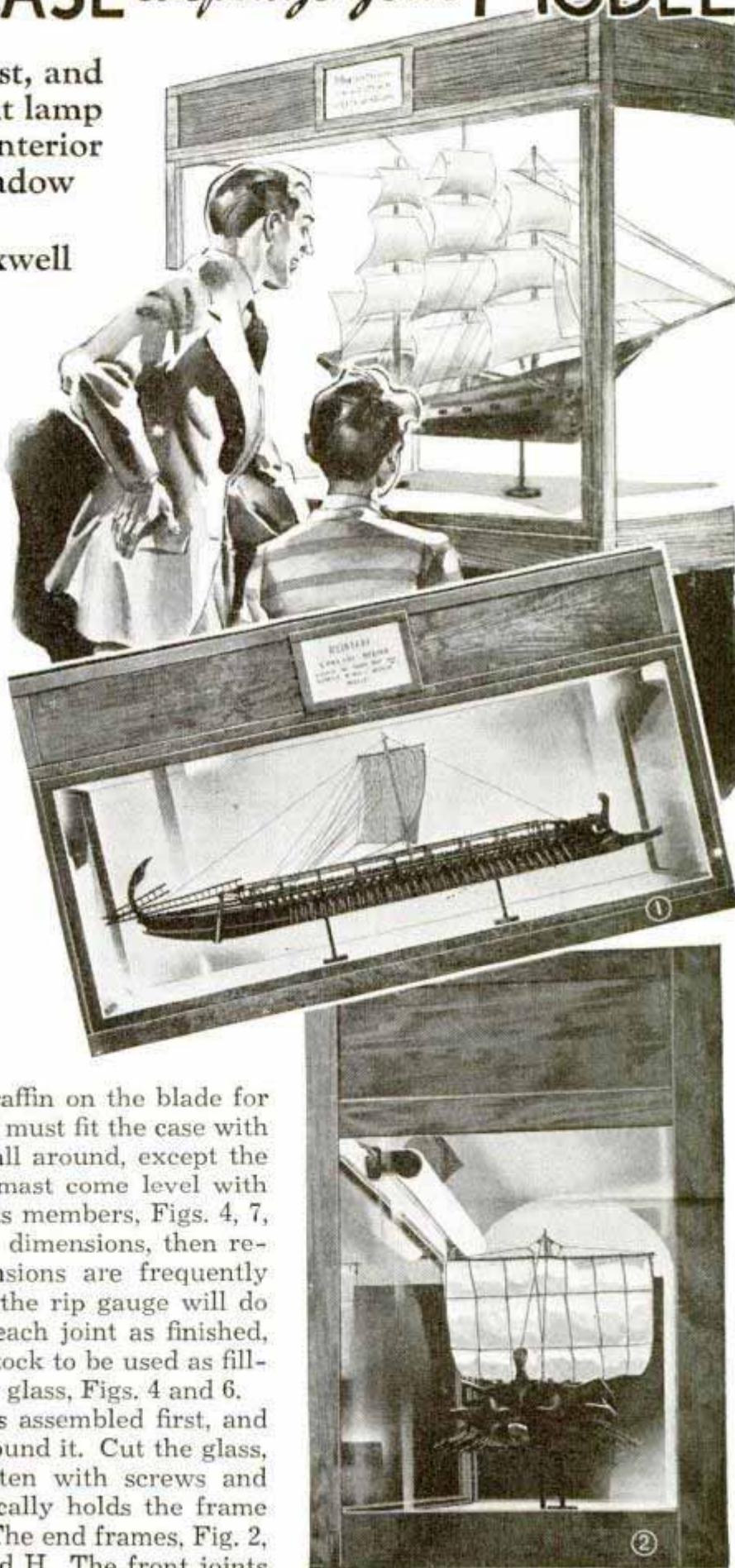
Sealed to exclude dust, and fitted with fluorescent lamp to illuminate the interior without glare or shadow

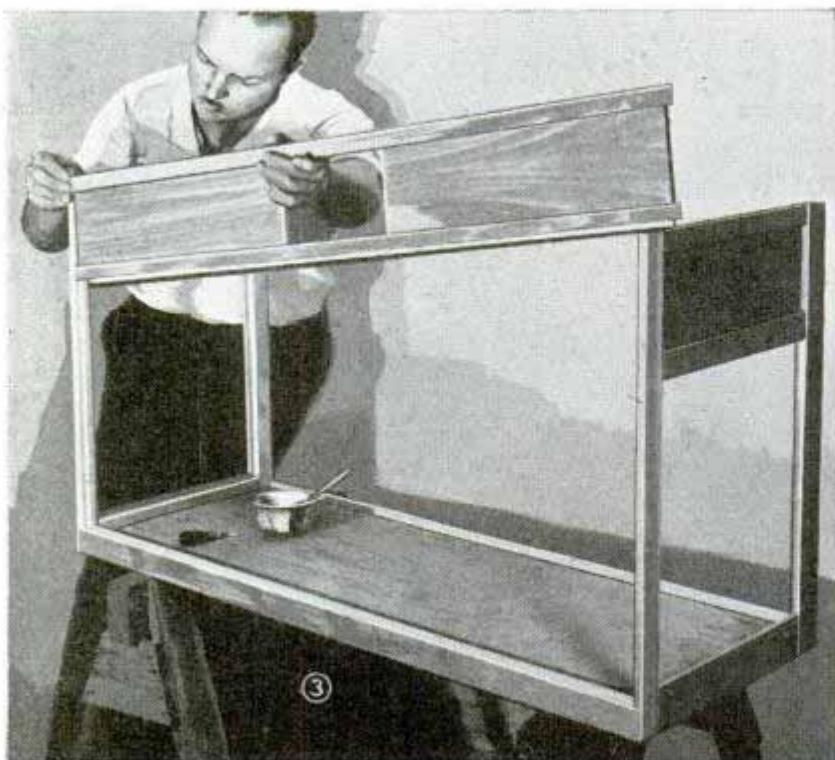
By Alexander Maxwell

IN THIS model case, soft, white glow of a fluorescent light is easy on the eyes, and it can be reflected until all shadows are nullified, making your ship stand out in bold relief against a background of pure white.

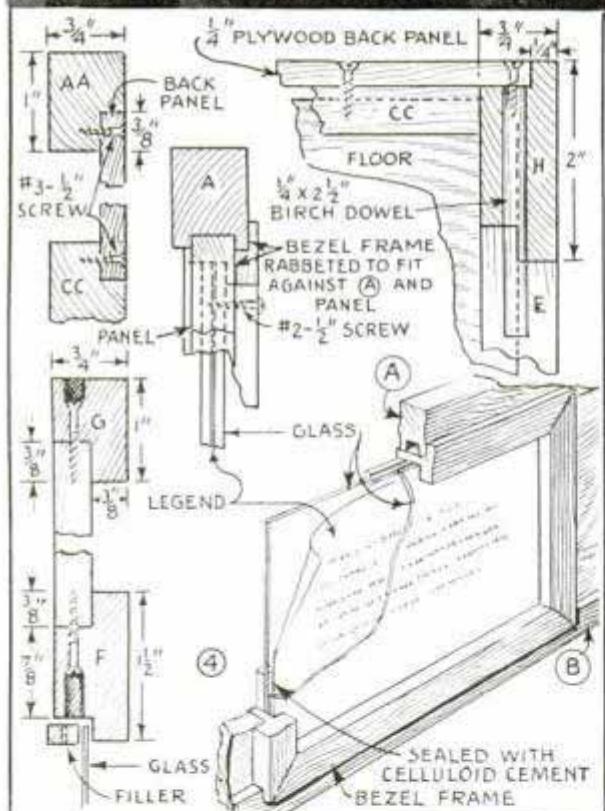
Dimensions are given for a case to fit the Greek trireme ship model described in past issues of Popular Mechanics, but they may be altered easily to fit any of the popular-sized models. Mahogany finished natural gives a rich effect. Cutting and fitting is done with a circular saw fitted with a planer blade. Keep the blade razor sharp. This is done by dressing the teeth with a slipstone as they start to dull. On long cuts, rub paraffin on the blade for side lubrication. The model must fit the case with about 2 or 3 in. clearance all around, except the top, where the tips of the mast come level with the door frame. The various members, Figs. 4, 7, and 8, are cut to maximum dimensions, then rebated as indicated. Dimensions are frequently repeated, so one setting of the rip gauge will do for a number of cuts. Fit each joint as finished, Fig. 3, and save the waste stock to be used as fillers for securing the window glass, Figs. 4 and 6.

The door frame, Fig. 7, is assembled first, and the rest of the case built around it. Cut the glass, fit the wood to it and fasten with screws and casein glue. This automatically holds the frame square until the glue sets. The end frames, Fig. 2, include parts D, E, F, G and H. The front joints

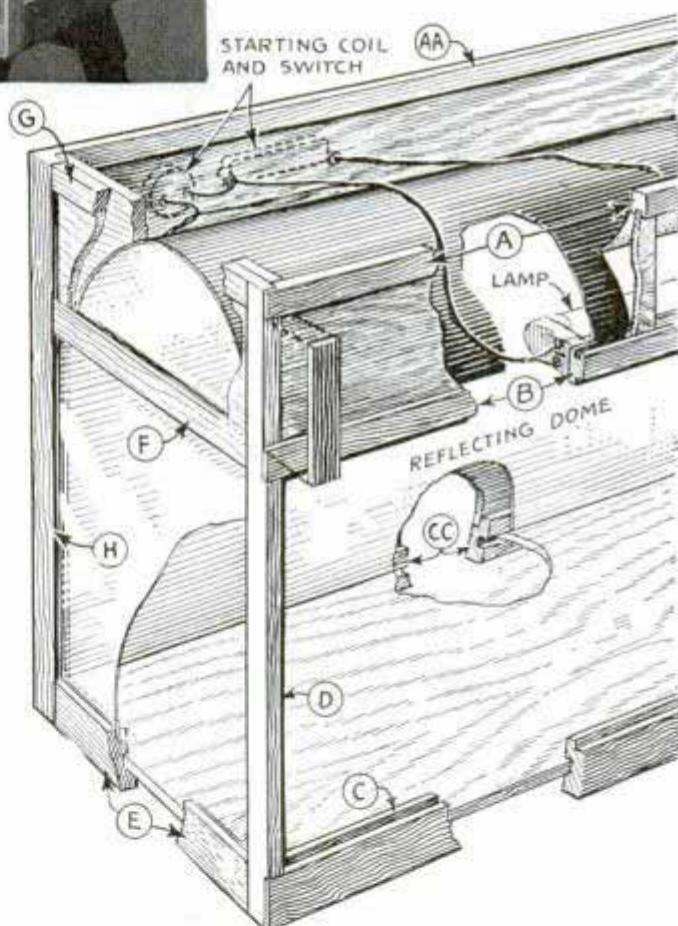




3



WITH
CEMENT
E



are screwed, those on the back doweled, Figs. 4 and 6, because there are no screws long enough available. Secure with clamps until dry. The plywood panels between G and F are glued and screwed with four No. 2, $\frac{3}{4}$ -in. screws, top and bottom. Drill No. 60 holes in panels to keep screws from bulging the veneer. Using your door frame as a gauge, cut and fit piece C, and follow with CC. Slide the floor in place and fasten

both C and CC to the end frames. C and D, Fig. 6, are cross-screwed, so no screws will appear on the front, Fig. 7. The bezel, Fig. 1, brings the usual printed matter up to eye level and tastily displays it with back lighting.

Mahogany is soft and scratches easily, so handle carefully and sand with No. 3-0 garnet paper after assembly. Finish sanding with No. 5-0 paper, which imparts a velvety luster. Whisk with a dry paintbrush and follow with a damp cloth. Dress down the raised grain with No. 5-0 paper, let the dust

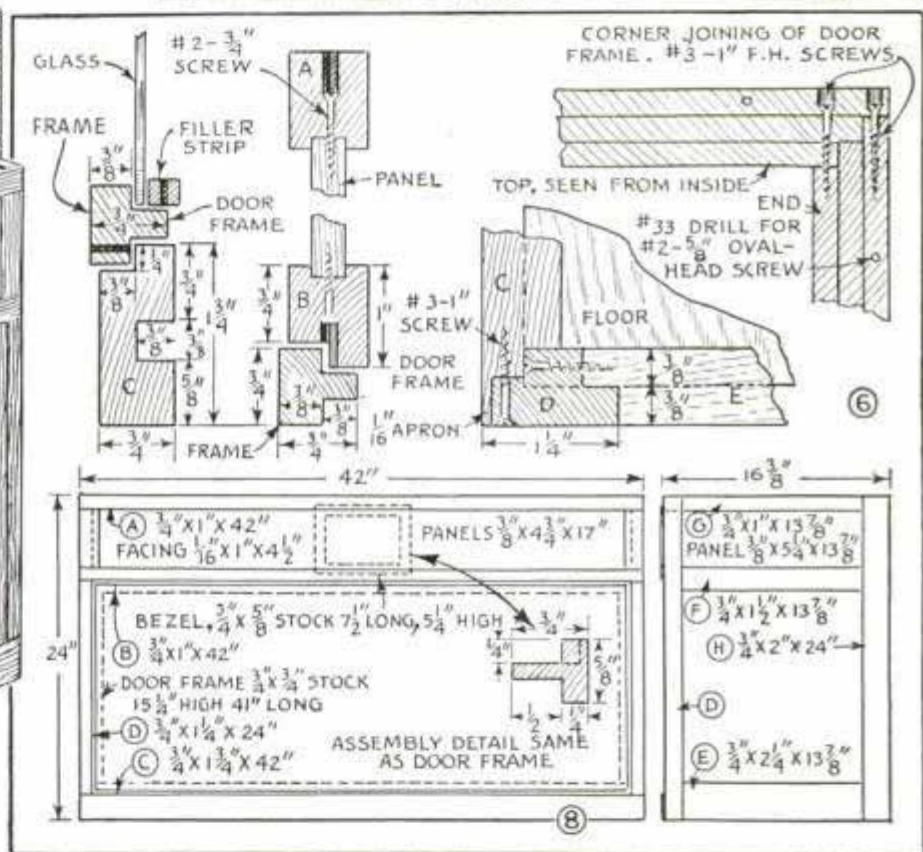
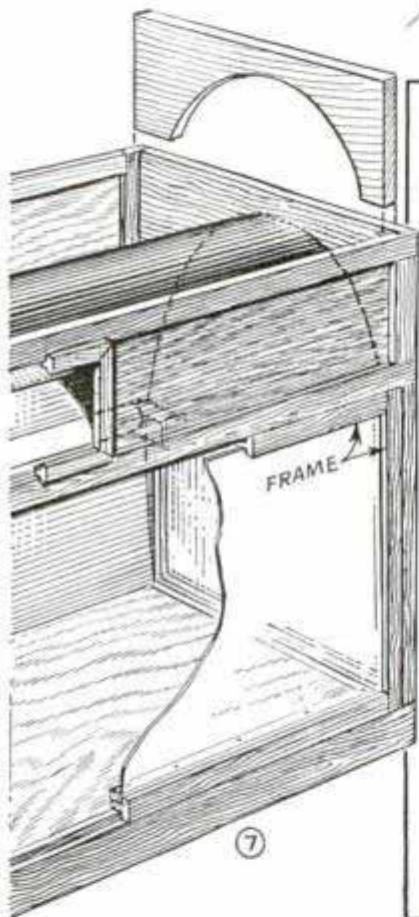
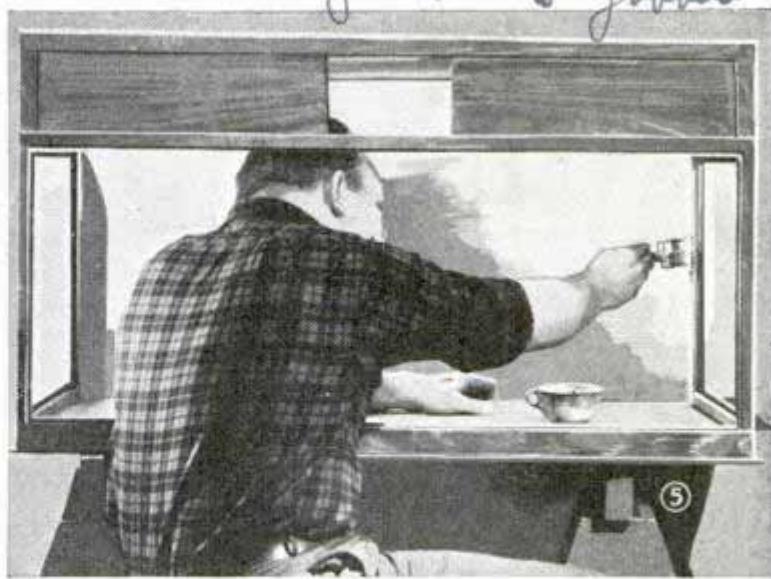
settle overnight and apply clear Bakelite varnish with a camel's-hair brush. Rub with No. 3-0 steel wool, give a second coat and rub that with wet or dry sandpaper. Buff the work with a felt pad dipped in dry rottenstone, then wax and polish. The back and top of the cabinet are $\frac{1}{4}$ -in. plywood panels painted black.

The reflecting dome is bent to shape, screwed to B, Fig 9, and held with two

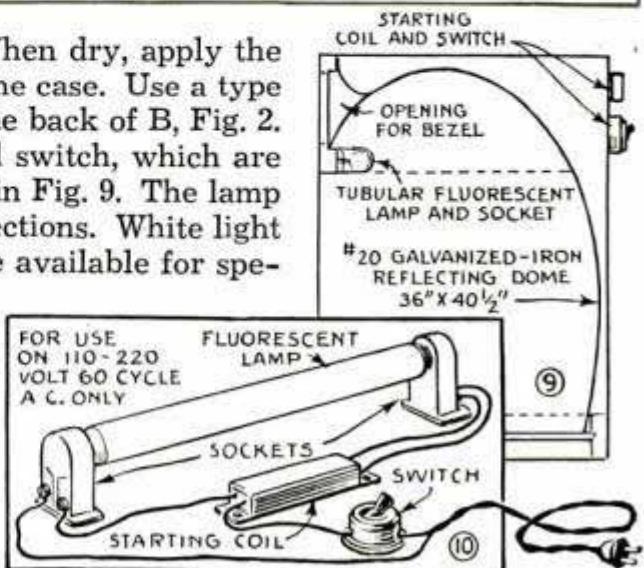
Hereward G. Clowood P.O.

Darien, Conn., jobber

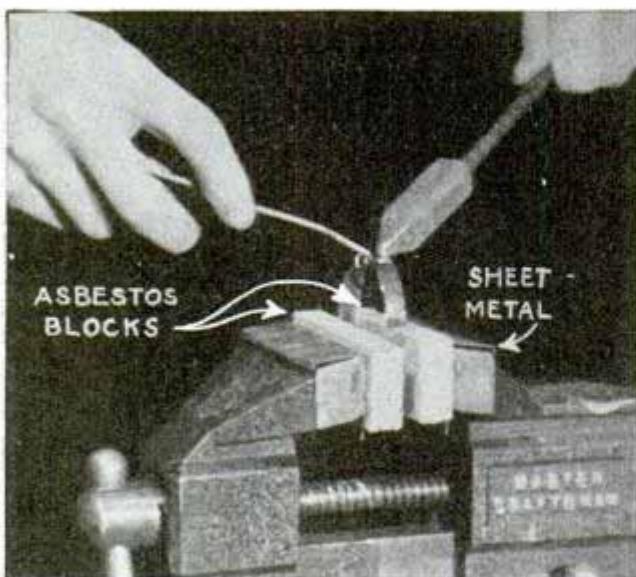
pattern blocks screwed to G, Fig. 7. Bend the iron first, then cut blocks to fit the natural curve. Spring pressure holds the metal against CC and floor. Calk the seams with marine glue and paint right over it. Flat white, casein cold-water paint has a reflection almost as much as silver, making the light from a single bulb bathe your ship on all sides. Three or more coats will be needed. Mix in a teacup and use a wide brush, well loaded. Make one stroke do,



for the second only lifts the one under it. When dry, apply the next coat, Fig. 5. Cover the entire inside of the case. Use a type T-12, 24-in. fluorescent lamp. Mount it on the back of B, Fig. 2. In addition you will need a starting coil and switch, which are mounted outside, on the back of the case, as in Fig. 9. The lamp is wired as shown in Fig. 10. Solder all connections. White light is preferable, but a number of color tints are available for special effects. Screw down the lid, without glue, spacing the screws closely and laying felt around the edges for a dust seal. When the ship is in place, insert the door and screw it down, taking care that the screwdriver does not slip. The life of the bulb is 1,500 hrs. and there should be no need to open the case short of that time.



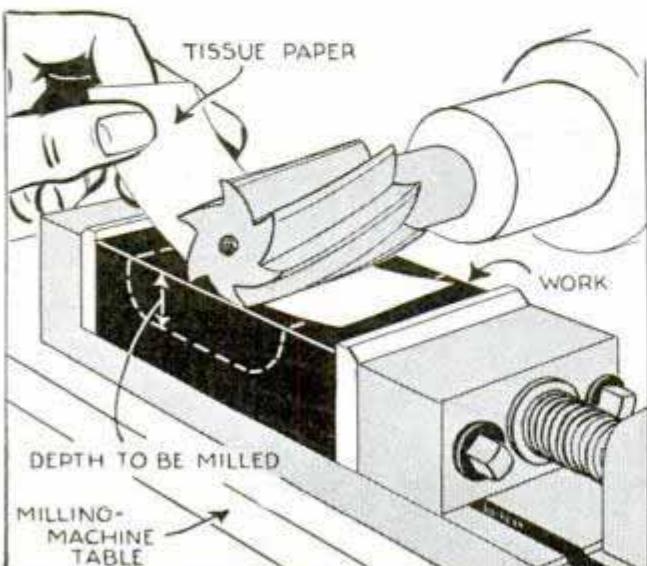
Insulating Vise Jaws Hold Work While Soldering It



Often it is convenient to grip a small piece of work in a vise to solder it, but the vise jaws rob the work of heat so fast that the job is difficult to do. In such cases, blocks of asbestos used as auxiliary vise jaws will solve the problem. If you have much of this type of work to do, cement the blocks to pieces of sheet metal shaped to slip over the vise jaws. The metal will hold the blocks in place when the vise is opened.—T. H. Taylor, Seattle, Wash.

Milling-Machine Cutter Set with Aid of Paper

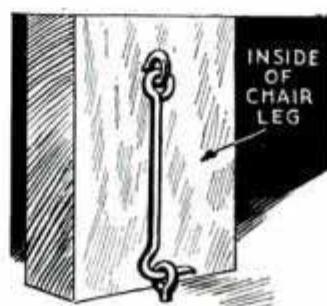
When it is necessary to make an accurate cut with a milling machine to depth from a surface of the work, considerable skill and care are required in determining just



the instant the edges of the milling cutter touch the work. The drawing shows how a thin strip of tissue paper may be used to simplify setting the cutter. The strip is held in the fingers with one end between the cutter and the surface of the work and the machine table gradually raised until the cutter pulls the paper. This will indicate the cutter is within approximately .001 inch of the surface. The cutter then may be set to the proper depth according to the dial on the machine hand-feed wheel. The method also may be used for setting an end mill, etc.

—Peter F. Rossmann, Kenmore, N. Y.

Chairs in Shops Latched to Floor by Screen-Door Hooks



Chairs in barber shops, beauty parlors and other public places can be fastened to the floor with screen-door hooks so that they can not be moved about by the people that use them. The hooks are placed on the inside surface of the front legs and engage with screw eyes driven into the floor. This method of fastening the chairs makes it easy to move them for cleaning the floor.

—Archie J. Maus, Spokane, Wash.

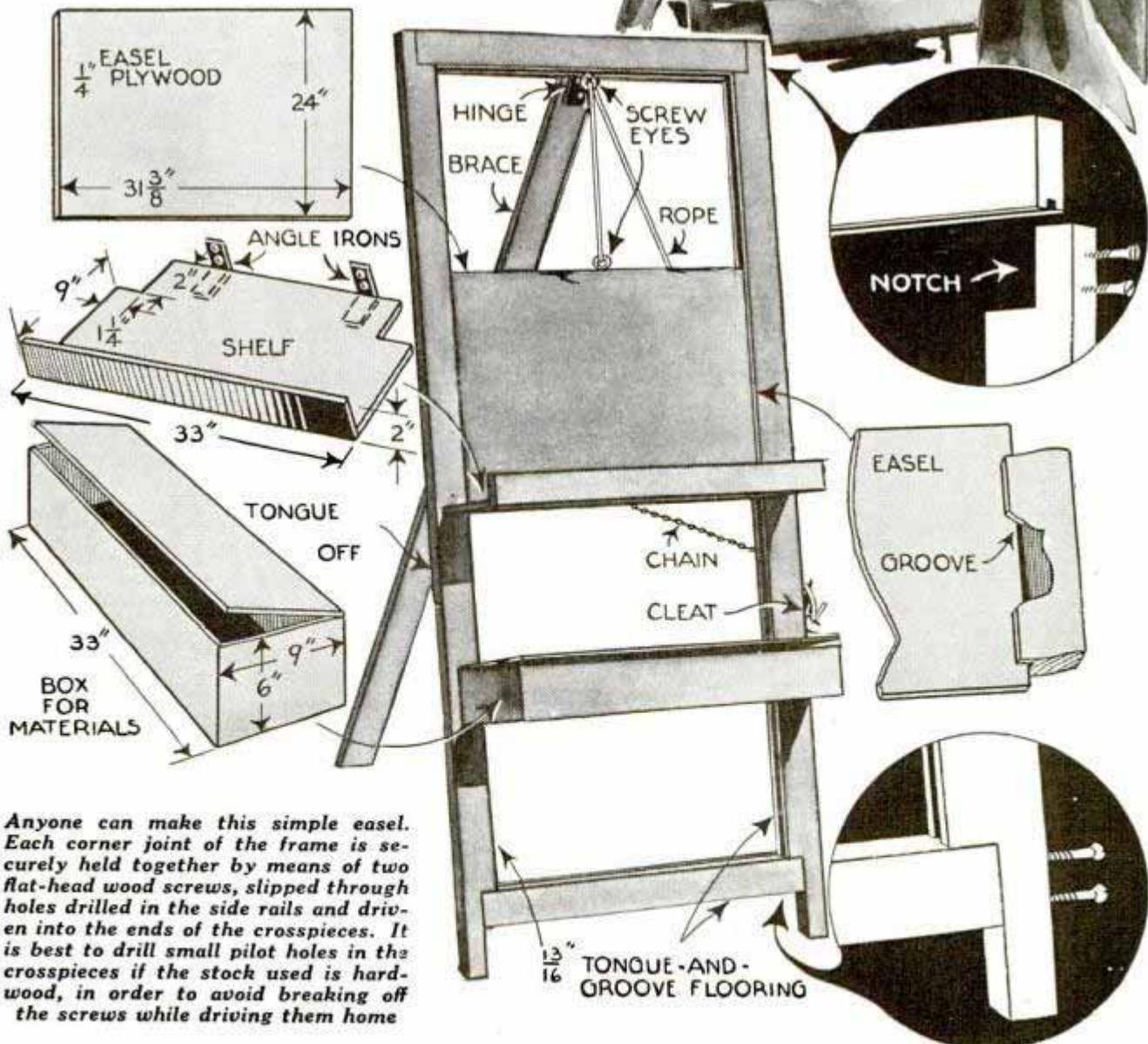
Toothbrush Cleans Threads Better Than Cloth

Before screwing a chuck or faceplate on a lathe spindle, I find a discarded toothbrush handy for cleaning the threads on the spindle. Also, the brush is better than a cloth for cleaning the internal threads of the chuck and faceplate as the bristles reach the spaces between the threads and do not leave lint as does a cloth.—S. A. Schaffer, Ford City, Pa.



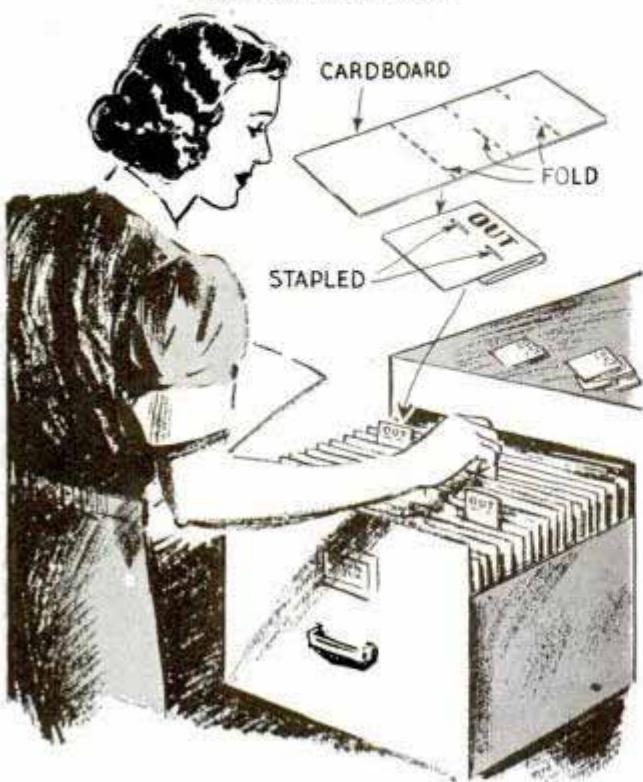
Artist's STUDIO EASEL is adjustable for height

Artists and sign painters always can have their work at a convenient height with this easel, which is made of flooring at small cost. A piece of plywood or hard-pressed board slides in the grooves of the side rails and a shelf to hold the work is attached to this sliding panel by means of angle brackets. The assembly is adjusted to suitable height with a rope which fastens to a cleat on one of the side rails, and slides through a screw eye or small pulley fastened to the top cross member. A separate strip of flooring serves as rear leg. It is hinged to the top cross member while a length of furnace chain prevents it from slipping back too far. A couple of large L-hooks can be driven into the side rails near the bottom to hold a maul stick. Also, a box to accommodate tools and accessories is screwed to the side rails in the position indicated.



Anyone can make this simple easel. Each corner joint of the frame is securely held together by means of two flat-head wood screws, slipped through holes drilled in the side rails and driven into the ends of the crosspieces. It is best to drill small pilot holes in the crosspieces if the stock used is hardwood, in order to avoid breaking off the screws while driving them home.

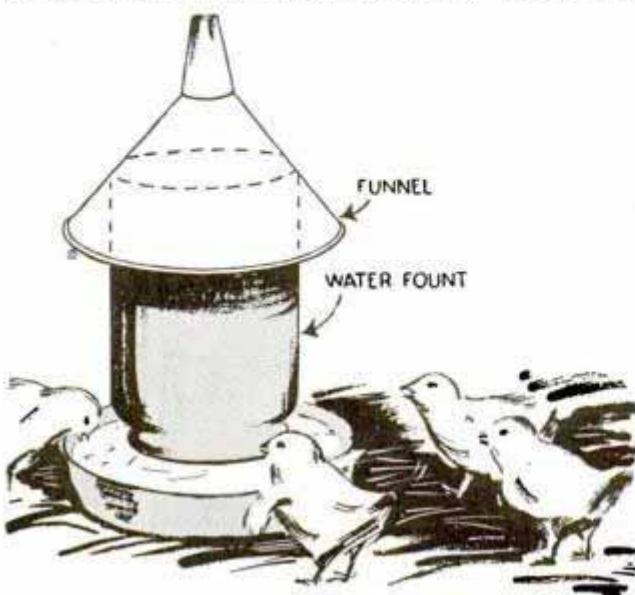
Cardboard 'Clothespin' Is Marker in Letter Files



An office manager employs folded strips of thin cardboard to mark places in filing cabinets where papers have been removed temporarily. These are stapled as indicated so that they can be slipped quickly over the file dividers, or over the edges of papers adjoining those that were removed.

Roosting of Chicks on Fountain Avoided by Funnel

One poultryman places a small, tin funnel on the top of his chicks' water fountain to keep them from roosting on top of it. If a



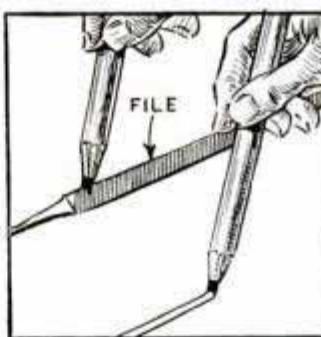
number of fountains are to be protected, coil springs from auto cushions could be used in a similar way.

Postman Has Tire Patches on Gloves to Sort Mail

Tire patches cemented to the thumbs and index fingers of his gloves are used by a mail carrier in Tempe, Ariz., to sort the mail while on his route without baring his hands when it is bitterly cold. The rubber surfaces of the patches enable him to pick out letters and papers without them slipping out of his hands



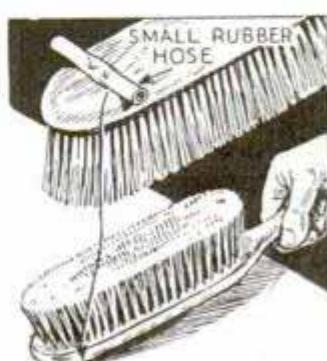
File Cuts Double Point on Pencil



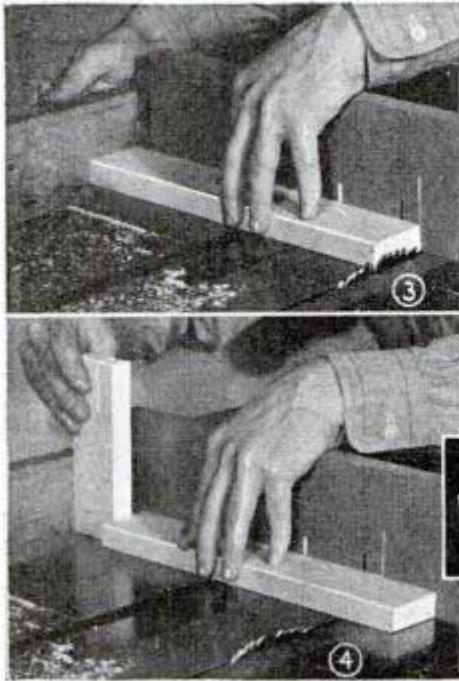
A Wisconsin carpenter claims that it is easier to cut a board accurately if the pencil is pointed to make a double line. By sawing between the lines the markings are always visible and the saw is easily guided accordingly. The pencil is kept sharpened for this purpose with a three-cornered file.

Rubber "Feet" Keep Brush Clean When Laid Down

To keep the bristles of his bench brush from being soiled or bent out of shape when laid down, one laboratory worker tacked a short length of small rubber hose across the back of the brush. The hose supported it with the bristles upward, and was flexible, to avoid scratching anything with which it came in contact

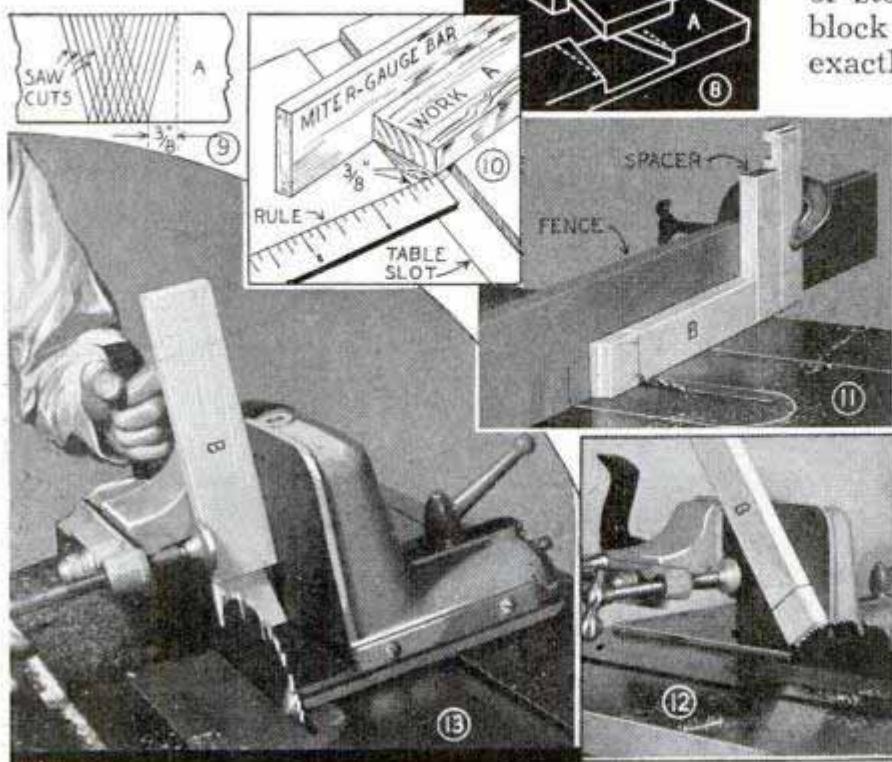


WOOD JOINTS



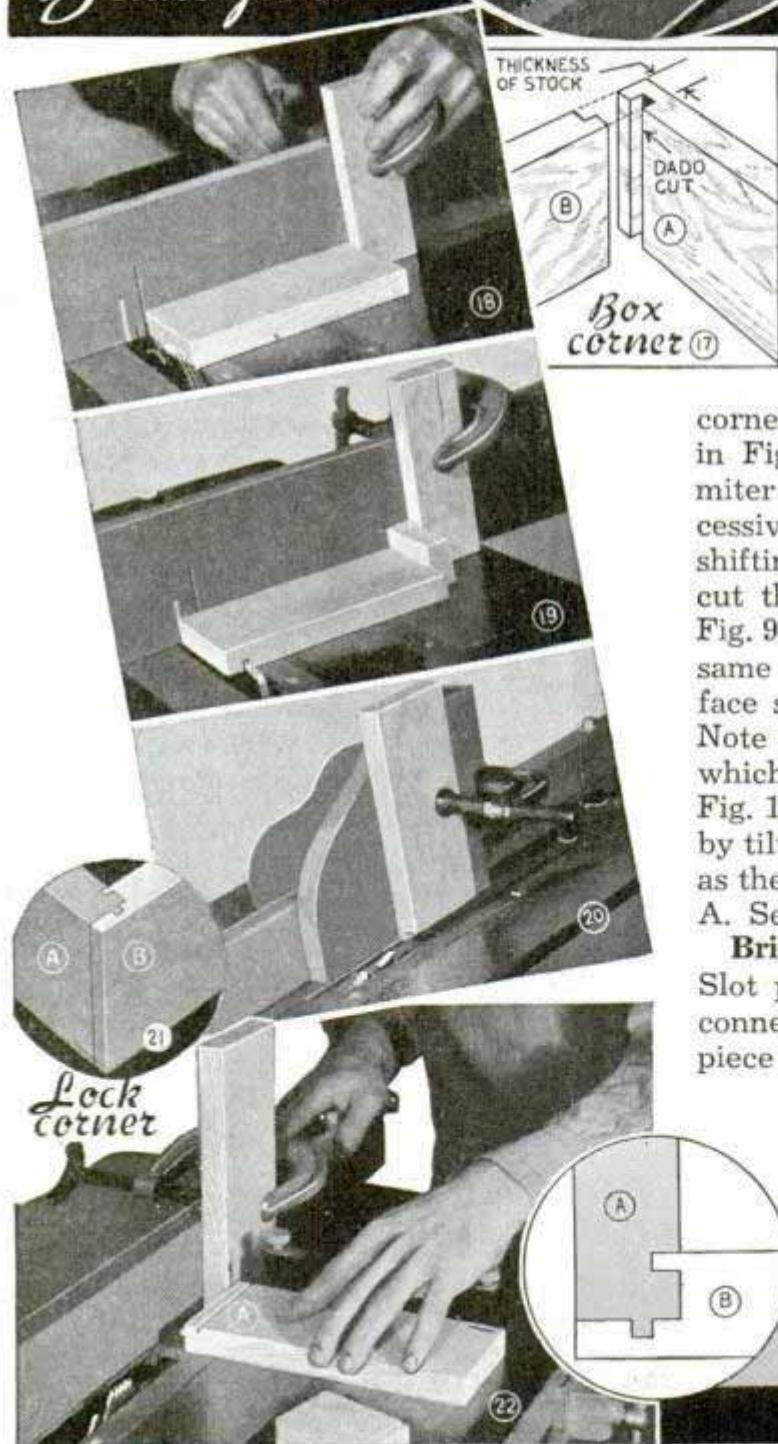
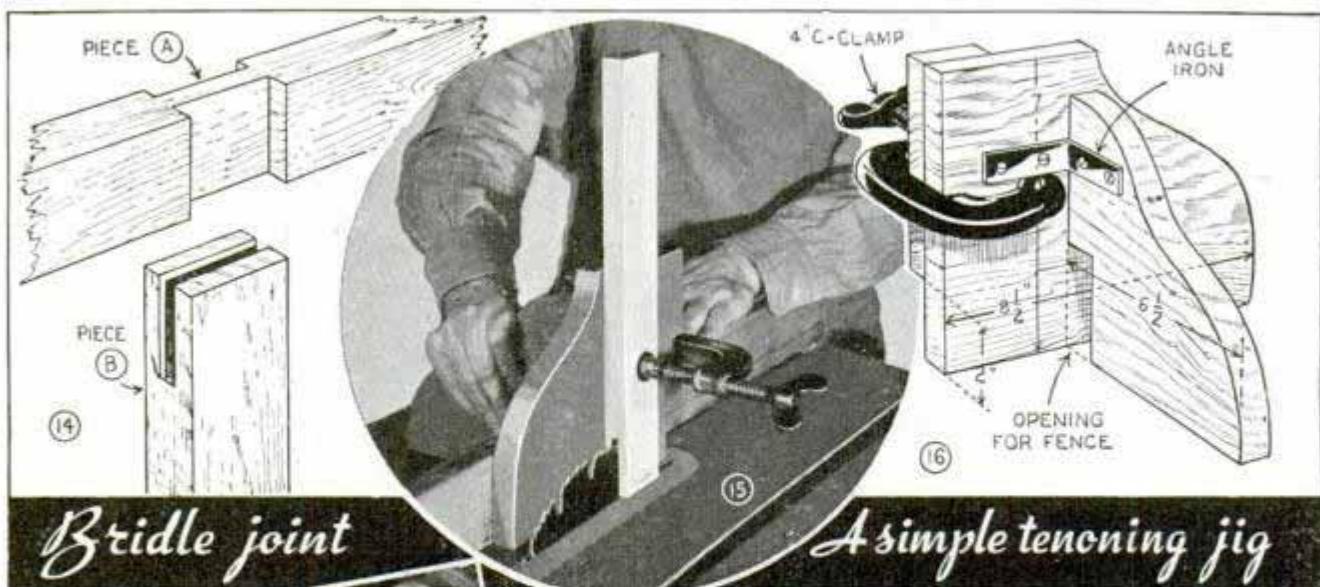
with POWER TOOLS

CUTTING wood joints with power tools differs from hand methods not only in the use of power but also in the greater use of mechanical methods to set off dimensions. This principle, faster and more accurate than cutting to a pencil line, is illustrated especially well



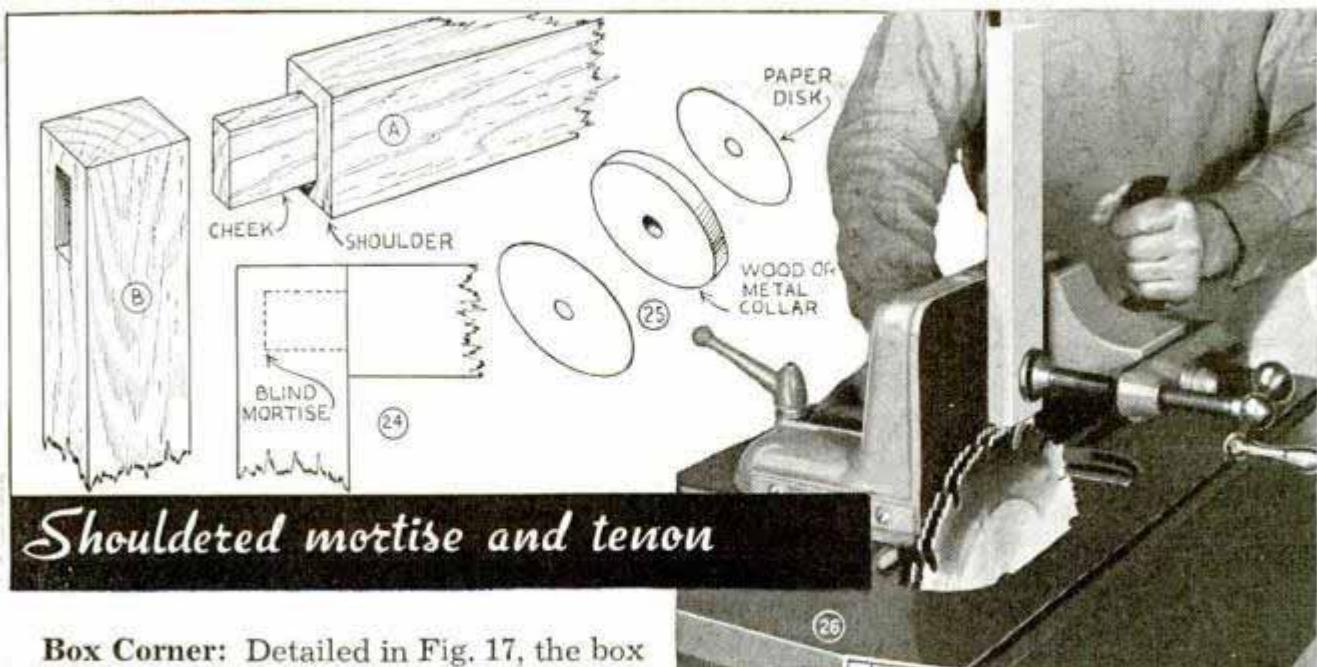
in the case of the halved or half-lap joint.

Halved Joints: Most common of these is the end half lap, Fig. 6. Both pieces are identical; either part is cut first. Set the saw to depth. Check by cutting from each side of a scrap piece. Set the shoulder cut by placing the end of the work against the saw blade and setting the fence at the opposite end, as in Fig. 3. A scrap piece of stock used as a setting-out block will locate the shoulder cut exactly, Fig. 4. When the cut is to be made in the middle of the work, as in the case of the middle half lap, Fig. 5, the setting-out block is a scrap of the stock ripped down the center and nailed back together, as in Fig. 2. Fig. 1 shows this block in use. The first cut is set to a pencil mark and a stop block is clamped to the miter gauge. Fitting the setting-out block in place, as shown, then locates the second cut, after which successive cuts across the work will remove excess material.



The mitered half lap, Fig. 7, is cut in the same manner as the end lap except that the miter gauge is used at 45 degrees as required. In cutting the dovetail half lap, Fig. 8, start with piece A. If the stock is $\frac{3}{4}$ in. thick, the depth of cut will be $\frac{3}{8}$ in. Swing the miter gauge until a dimension taken at the corner of the work equals $\frac{3}{8}$ in., as shown in Fig. 10. Note how many degrees the miter gauge is swung, and then make successive cuts to remove excess material, shifting the gauge to the opposite side to cut the other side of the opening, as in Fig. 9. To cut piece B, leave the saw at the same depth and cut shoulders from the face side and edges, as shown in Fig. 11. Note the saw cut at the end of the work, which is used to set the face cheek cut, Fig. 12. The slanting cheek cuts are made by tilting the saw table to the same setting as the miter gauge was set in cutting piece A. See Fig. 13.

Bridle Joint: This is shown in Fig. 14. Slot piece B first, using a single saw in connection with the tenoning jig, then cut piece A in the same manner as for a middle half-lap joint. See Fig. 15. Details of the tenoning jig used for all joint work are shown in Fig. 16.

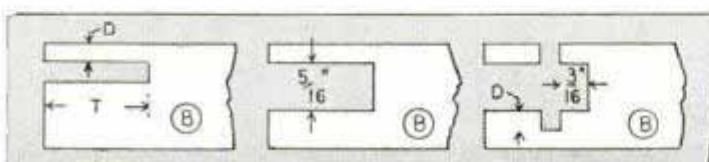
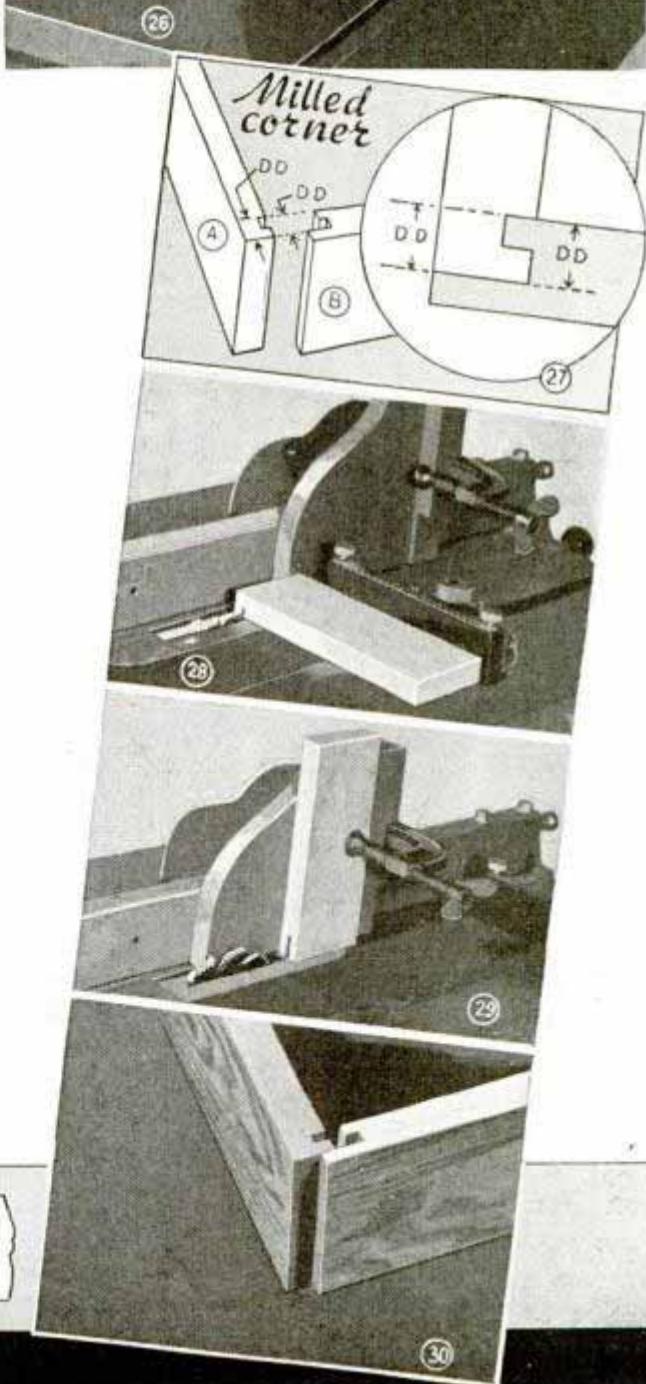


Shouldered mortise and tenon

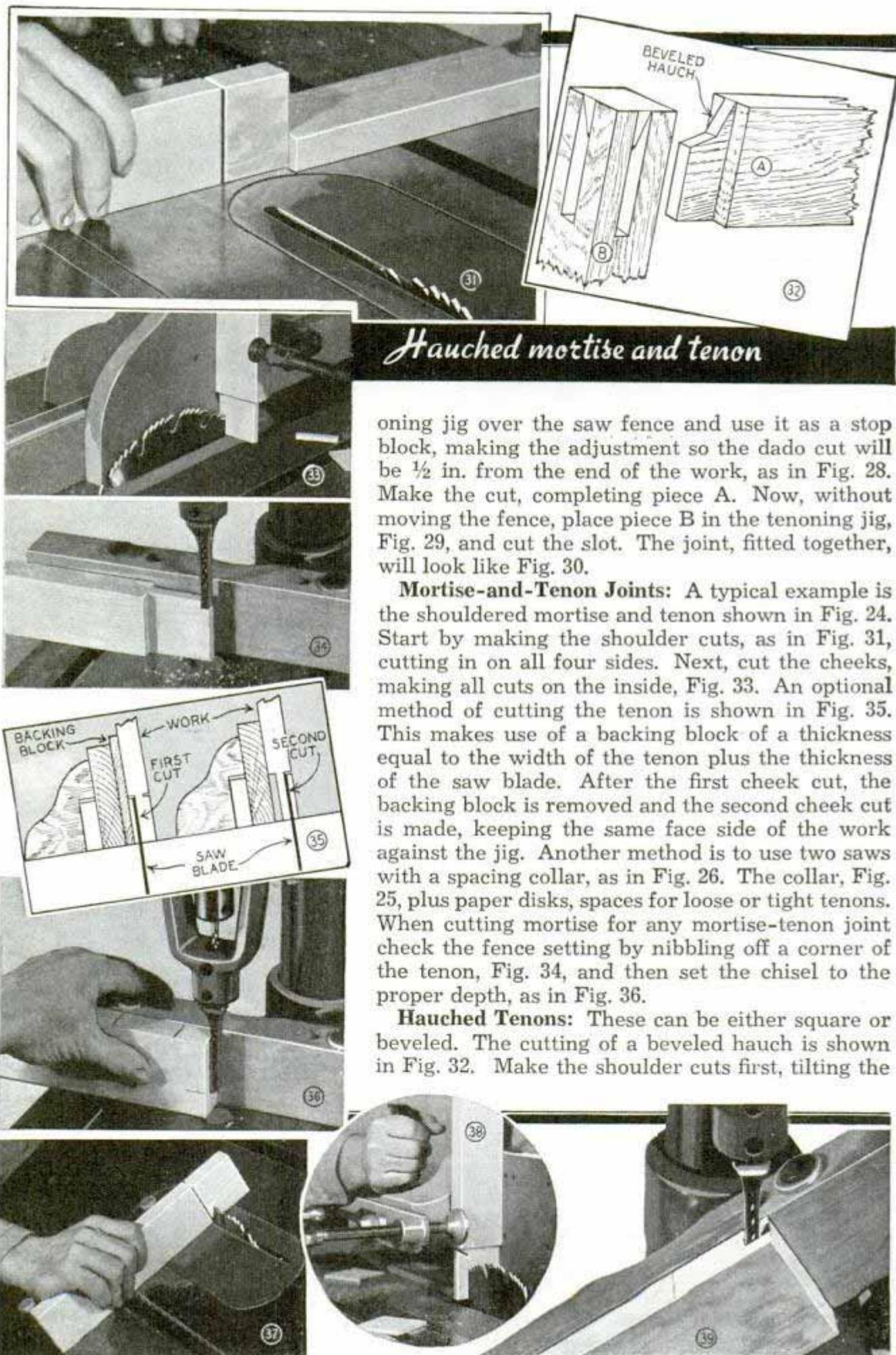
Box Corner: Detailed in Fig. 17, the box corner is cut with the dado head, $\frac{1}{4}$ in. being the usual standard for $\frac{3}{4}$ -in. stock. Set the work against the side of the saw and clamp a stop block to the miter gauge, as in Fig. 18. A scrap piece of the stock sets the dado cut, as in Fig. 19. With the saw set at the same depth, cut the rabbet in piece B. This operation is shown in Fig. 20. The work is moved until the remaining tenon fits the groove in piece A.

Lock-Corner Joint: Fig. 21 shows this joint. It is cut with a single dado saw, $\frac{1}{8}$ in. thick. The saw is set to a depth of $\frac{3}{16}$ in. and the first and second cuts are made on piece A. The third cut on piece A is of such a depth as to leave a tenon the same thickness as the dado saw ($\frac{1}{8}$ in.). Fig. 22 shows this cut being made. The first cut on piece B is set in $\frac{1}{8}$ in. from the edge, and is carried across until the groove fits the first piece. The final cut on piece B cuts the tongue to the right length and also cuts the groove for the tongue at the end of the first piece. See Fig. 23 for successive steps in forming a lock-corner joint.

Milled Corner: This is an excellent box or drawer joint. Notice in Fig. 27 the dimensions marked DD (double dado). If a $\frac{1}{4}$ -in. thick dado combination is used, these dimensions would be $\frac{1}{2}$ in. Place the ten-



in making lock corner joint



oning jig over the saw fence and use it as a stop block, making the adjustment so the dado cut will be $\frac{1}{2}$ in. from the end of the work, as in Fig. 28. Make the cut, completing piece A. Now, without moving the fence, place piece B in the tenoning jig, Fig. 29, and cut the slot. The joint, fitted together, will look like Fig. 30.

Mortise-and-Tenon Joints: A typical example is the shouldered mortise and tenon shown in Fig. 24. Start by making the shoulder cuts, as in Fig. 31, cutting in on all four sides. Next, cut the cheeks, making all cuts on the inside, Fig. 33. An optional method of cutting the tenon is shown in Fig. 35. This makes use of a backing block of a thickness equal to the width of the tenon plus the thickness of the saw blade. After the first cheek cut, the backing block is removed and the second cheek cut is made, keeping the same face side of the work against the jig. Another method is to use two saws with a spacing collar, as in Fig. 26. The collar, Fig. 25, plus paper disks, spaces for loose or tight tenons. When cutting mortise for any mortise-tenon joint check the fence setting by nibbling off a corner of the tenon, Fig. 34, and then set the chisel to the proper depth, as in Fig. 36.

Haunched Tenons: These can be either square or beveled. The cutting of a beveled hauch is shown in Fig. 32. Make the shoulder cuts first, tilting the

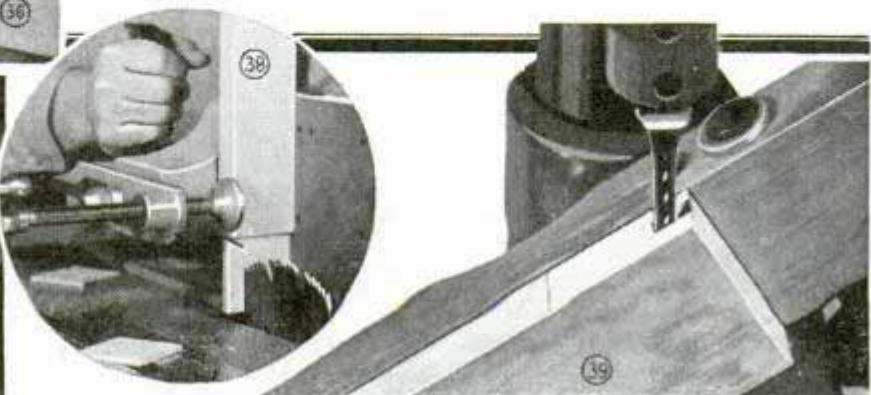
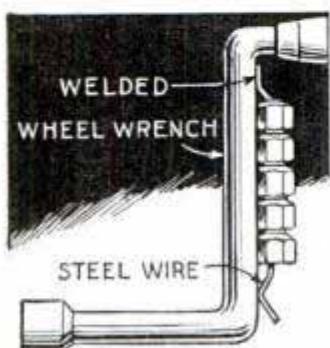


table to shoulder the hauch, as in Fig. 37. Then make the cheek cuts, as in Fig. 38. In cutting the mortise, tilt the drill table for the hauch, checking by holding the tenon in place against the fence. Make the angle cuts first, as in Fig. 39, then level the table and cut the rest of the mortise.

Nut Holder on Wheel Wrench



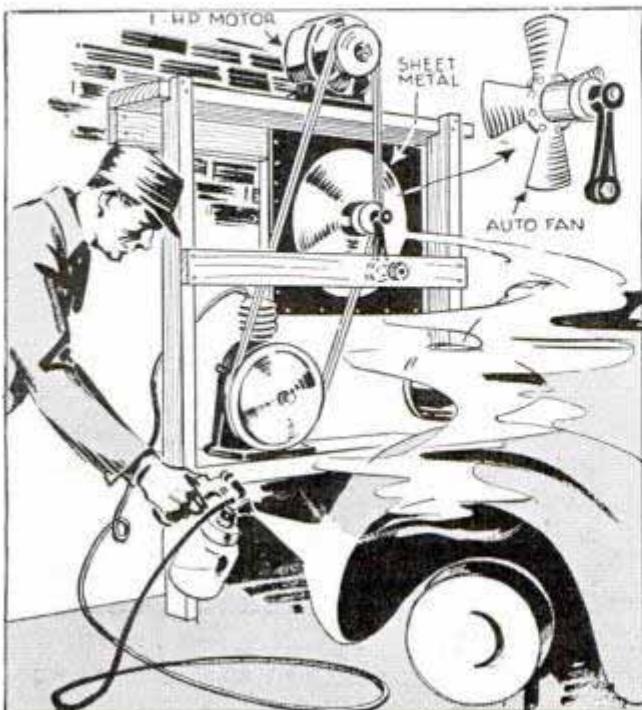
Wheel nuts will not be lost when removed if they are slipped under a short length of spring wire, which has been brazed to the wrench as indicated. The wire should be of a good quality so that it

will not bend out of shape when the nuts are slipped on it.—E. Hanson, Argyle, Wis.

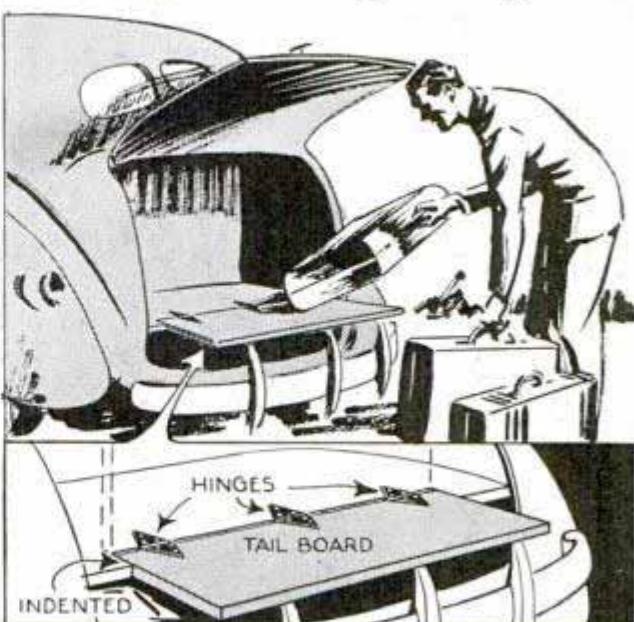
Auto Fan Exhausts Paint Fumes from Spray Booth

Desiring to economize on equipment for my paint-spraying shop, I rigged up an exhaust fan to remove paint fumes from the spraying booth by using an auto fan, which was driven by the belt that run the compressor. The drawing shows the arrangement. A model-T Ford fan was used.

—Walter Cox, Dundas, Ontario, Can.



Tailboard on Luggage Carrier Aids in Loading Packages



Bumper guards do not interfere when loading heavy luggage into your car trunk if the latter is provided with a tailboard, which folds down over the guards as shown. The board tends to provide a platform from the trunk to the edge of the bumper. The front edge of the shelf over the spare tire in the trunk is cut away an amount equal to a little more than the thickness of the board, which is then hinged in place as indicated. After the trunk has been loaded, the board is raised up against the luggage.

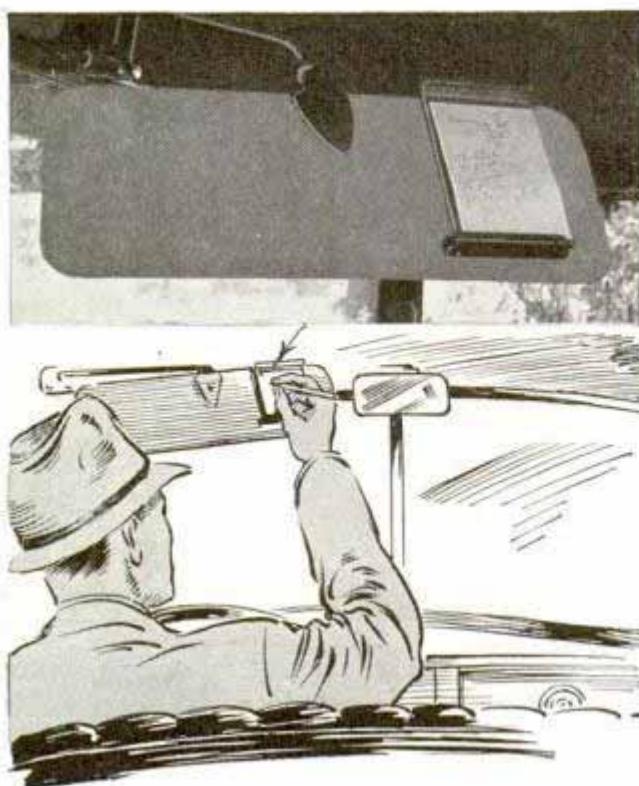
Wet Blotter or Cardboard Used in Cutting Tire Patches

Sheet rubber for repairing inner tubes may be cut to the desired shape much more easily, and without sticking to the shears, if the sheet is first placed upon a moist blotter or piece of heavy cardboard as shown. When shaping the patch, cut through both the rubber and blotter.



Paint can be removed from window glass with a strong solution of washing soda.

Spring Clips Keep Memo Pad on Sun Visor

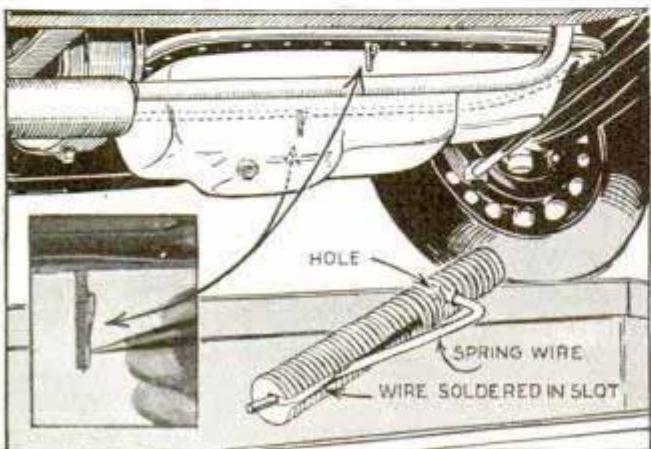


Mounted on the back of the glare visor in a car, a couple of spring clips furnish a handy place to keep a road map or a pad of memo paper. A pad, mounted as shown, is instantly available to the driver of the car without stopping.

—K. S. Anderson, Fort Mills, P. I.

False Studs Support Crankcase When Starting Cap Screws

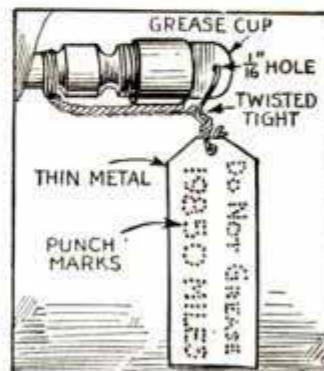
The problem of holding a crankcase in place while starting the cap screws is solved with a couple of studs of the type shown. A long slot is cut in each one to take a length of spring wire bent as indicated to slip in a hole in the top of the



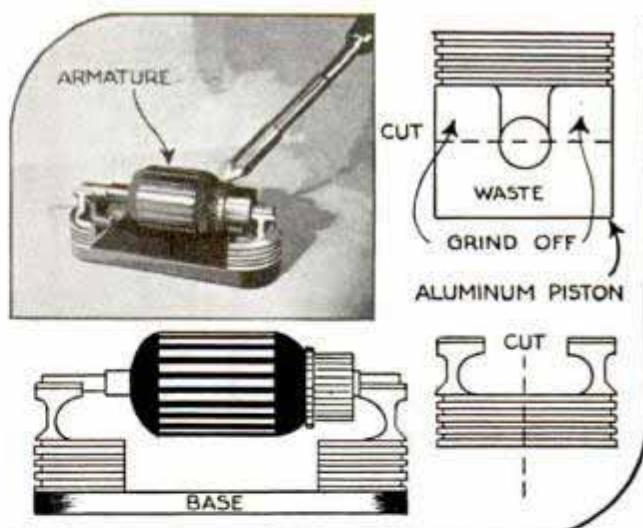
stud. In use, the studs are started in holes in opposite sides of the motor. Then the case is slipped over them, the spring wires providing shoulders that support it.

Excessive Greasing of Clutch Bearing Avoided by Tag

As the clutch throw-out bearings on most cars require lubrication only once in several thousand miles, greasing is often over-done, causing grease to get on the clutch facings and result in grabbing. To avoid this trouble, one motorist attached a tag to the grease cup showing at what mileage the bearing should be lubricated.

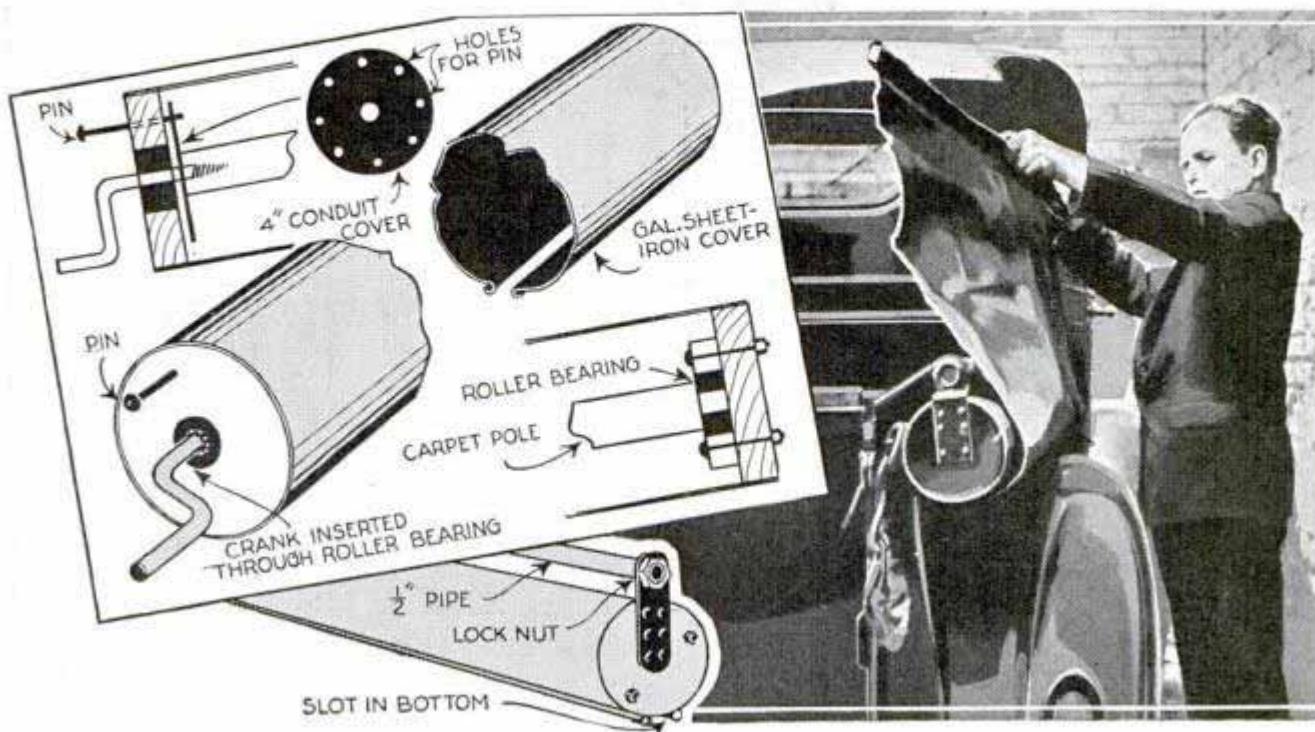


Handy Rack Holds Armatures While Testing Them



By cutting down a discarded aluminum alloy piston, as shown, you can make a useful rack for holding auto generator and starting-motor armatures for testing or other work. Cut the piston in two along the center line of the wrist-pin holes and then bisect the top portion. Grind away the excess metal at the sides of the holes and drill two screw holes in each half. Make a wooden base from 1-in. stock and cut the ends to conform to the curvature of the piston.

Housed Cover Quickly Unrolled over Truck



Here is a tarpaulin for your pick-up truck that can be pulled over the load in a jiffy; it is unrolled from a container fastened right on the side of the truck body. The container is a large sheet-metal tube having the ends closed with wood disks. Bearings in the disks carry a section of carpet or rug pole on which the tarpaulin

is wound, a slot being provided along the bottom side of the tube to admit the tarpaulin. A crank is provided at one end for winding, as indicated, and a metal disk, such as a conduit cover, is made fast to the end of the pole to take a pin as shown, to keep the tarpaulin from unrolling.

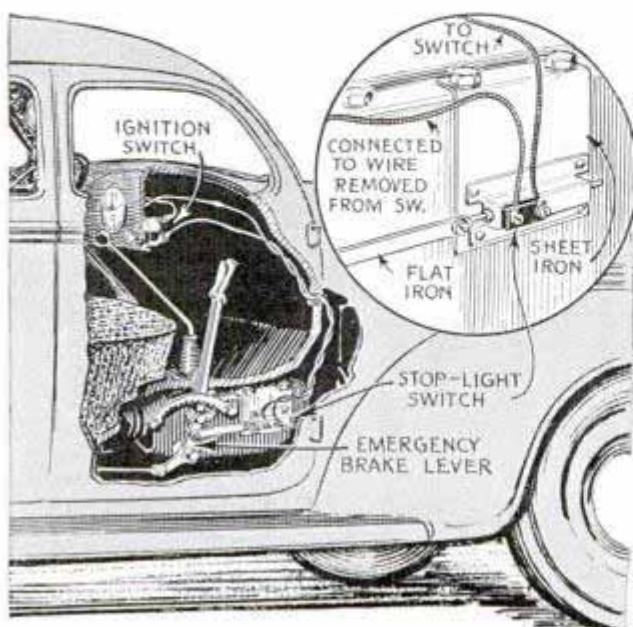
—J. H. Dunnewin, Grand Rapids, Mich.

Switch Opens Car Ignition Circuit When Brakes Are Set

A motorist who damaged his emergency brake by driving away without releasing it, wired his ignition circuit so that the

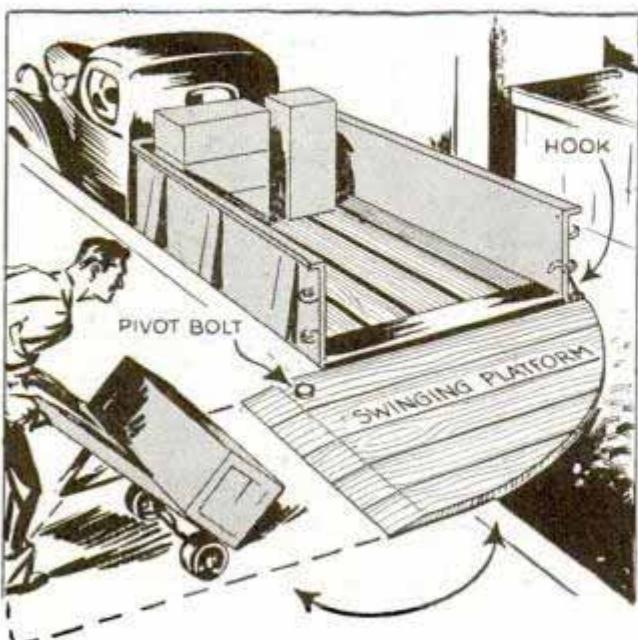
motor could not be started until the brake was released. This was done by putting a stoplight switch in the circuit between the battery and the ignition switch, the stoplight switch being connected to the brake lever so that it opened the circuit when the brake was set, and closed the circuit when the brake was released. The circular detail shows how the switch was mounted by means of a piece of sheet iron fastened under bolt heads in the transmission. Be sure that wires leading to the switch do not rub against any metal.

—Oliver D. Messner, Akron, Ohio.



When installing a clutch you can center it easily with a hardwood pilot. Insert the pilot through the clutch plate into the flywheel, tighten the clutch cover, then remove the pilot and the transmission will slide in place.

Swinging Platform Saves Space When Loading Trucks

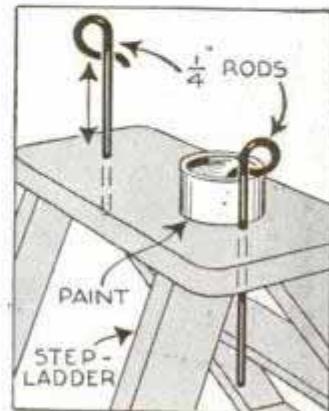


This novel, swinging platform was designed by a produce merchant to allow trucks to be loaded in a narrow alley without

congesting other traffic. The platform is pivoted to the regular loading platform, and is provided with a stout hook so that it can be attached to the trucks. It is made of heavy planks assembled with iron rods.

Paint Cans Kept on Stepladder by Rods Through Top

To keep small paint cans from sliding off his stepladder when moving it from place to place on a window-sign job, one artist bent two lengths of $\frac{1}{4}$ -in. rod as indicated, and slipped them into holes in the top step. In use, the rods are merely lifted and dropped so that the extending hooks engage the rims of the cans.



Starting Early on Your GARDEN CHAIR

Curved, slatted seat of this style assures comfort, and varied color scheme adds charm to the garden

AN EARLY START: Now is the time to get your garden furniture in shape for next season. Making a set of these handsome chairs during winter months assures having them at hand when many outdoor jobs will require your time.

VARIED COLOR SCHEME: Along the trend of vari-colored kitchenware, so popular, these chairs can be given a two-tone effect or each of them a different, vivid color, providing life and sparkle in the garden before most flowers are in bloom.

ONLY HAND TOOLS NEEDED: Anyone having a few hand tools can build these chairs without any difficulty. Ripping boards to exact widths is avoided as the plans call for stock sizes of lumber. Most of the joints are screwed together to obtain rigidity and long life.

FULL DETAILS IN CRAFTPLAN: Besides showing all parts and their complete dimensions, Craftplan No. 3010 shows just how parts are assembled even to the smallest details, such as the screw sizes, and the size holes to drill for them to avoid splitting stock. Craftplan also contains full instructions how to proceed step by step. Just fill out the coupon and remit ten cents and the Craftplan will be forwarded to you.

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Brownie—you get the same interesting snaps indoors that you get outdoors.

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YOU
NEED . . .**

**"Have you ever noticed
that Camels burn
longer and give you
more smoking?"**

ASKS VAN CAMPEN HEILNER
FAMOUS GAME AND FISHING AUTHORITY



Above, "VAN" waiting in the duck blinds for the "zero hour." Explorer, sportsman, scientist, conservationist, author of the authoritative, new "A Book on Duck Shooting," Heilner knows the waterfowl flyways from California to Maine, Alaska to Mexico, and those of Europe too. "VAN" has been a Camel smoker for 18 years.

You can tell a lot about a cigarette by whether it burns fast or slowly. Camel cigarettes are noted for their long burning. In fact, they burned longer, slower than any other brand tested, in recent scientific studies. Van Campen Heilner, the famous American authority on wild game, points out an interesting angle to this. "Camels give more smoking because they burn so slowly," he says. "And I think the way those choice tobaccos

burn is a very good way to judge the quality of cigarettes too. I notice this about Camels—I can smoke them steadily and they still taste smooth and cool, and my mouth feels fresh—and there's no throat irritation. Camels are mild, flavorful. They give more pleasure per puff—and more puffs per pack." Turn to Camels. Get extra smoking per pack—topped off with the delicate taste of choice quality tobaccos. For contentment—smoke Camels!

CAMELS—

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Whatever price you pay per pack, it's important to remember this fact: By burning 25% slower than the average of the 15 other of the largest-selling brands tested—slower than any of them—CAMELS give a smoking plus equal to

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Cigarettes were compared recently...sixteen of the largest-selling brands...under the searching tests of impartial laboratory scientists. Findings were announced as follows:

1 CAMELS were found to contain MORE TOBACCO BY WEIGHT than the average for the 15 other of the largest-selling brands.

2 CAMELS BURNED SLOWER THAN ANY OTHER BRAND TESTED—25% SLOWER THAN THE AVERAGE TIME OF THE 15 OTHER OF THE LARGEST-SELLING BRANDS! By burning 25% slower, on the average, Camels give smokers the equivalent of 5 EXTRA SMOKES PER PACK!

3 In the same tests, CAMELS HELD THEIR ASH FAR LONGER than the average time for all the other brands.

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MORE PUFFS PER PACK!

PENNY FOR PENNY
YOUR BEST CIGARETTE BUY!

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Tobacco Company
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Long-Burning Costlier Tobaccos

Challenge of the Supercharger

(Continued from page 884)

to a dynamometer and fitted with a carburetor that is kept under pressure and that is connected to a compressed-air tank that furnishes an air supply of any desired pressure. The engine had an original compression ratio of five and five-tenths to one and developed eighty-two horsepower at 4,000 revolutions per minute on seventy-eight octane fuel. When supercharged to an intake manifold pressure of ten inches of mercury and with the compression ratio reduced to four and twenty-five hundredths to one, the engine developed sixty-three per cent more power on the same fuel. With the same amount of supercharging and with its original compression ratio, using gasoline of an octane value of ninety, the engine showed a power increase of ninety-six per cent over its unsupercharged performance. Except at low engine speeds, fuel consumption with the engine supercharged was materially less than with the engine unsupercharged. The test figures indicate that positive induction will permit smaller, more economical engines that will still deliver enough power for fast get-aways and high-speed driving. One problem that arises in supercharger installations is that the ordinary supercharger is geared directly to the engine and that it is most efficient at wide-open throttle. At low engine speeds the supercharger contributes little additional power, and gasoline consumption mounts. The "power cost" of turning the supercharger over at low engine speeds is greater than its advantages. Automotive engineers are hunting for some way to make the supercharger efficient at all speeds.

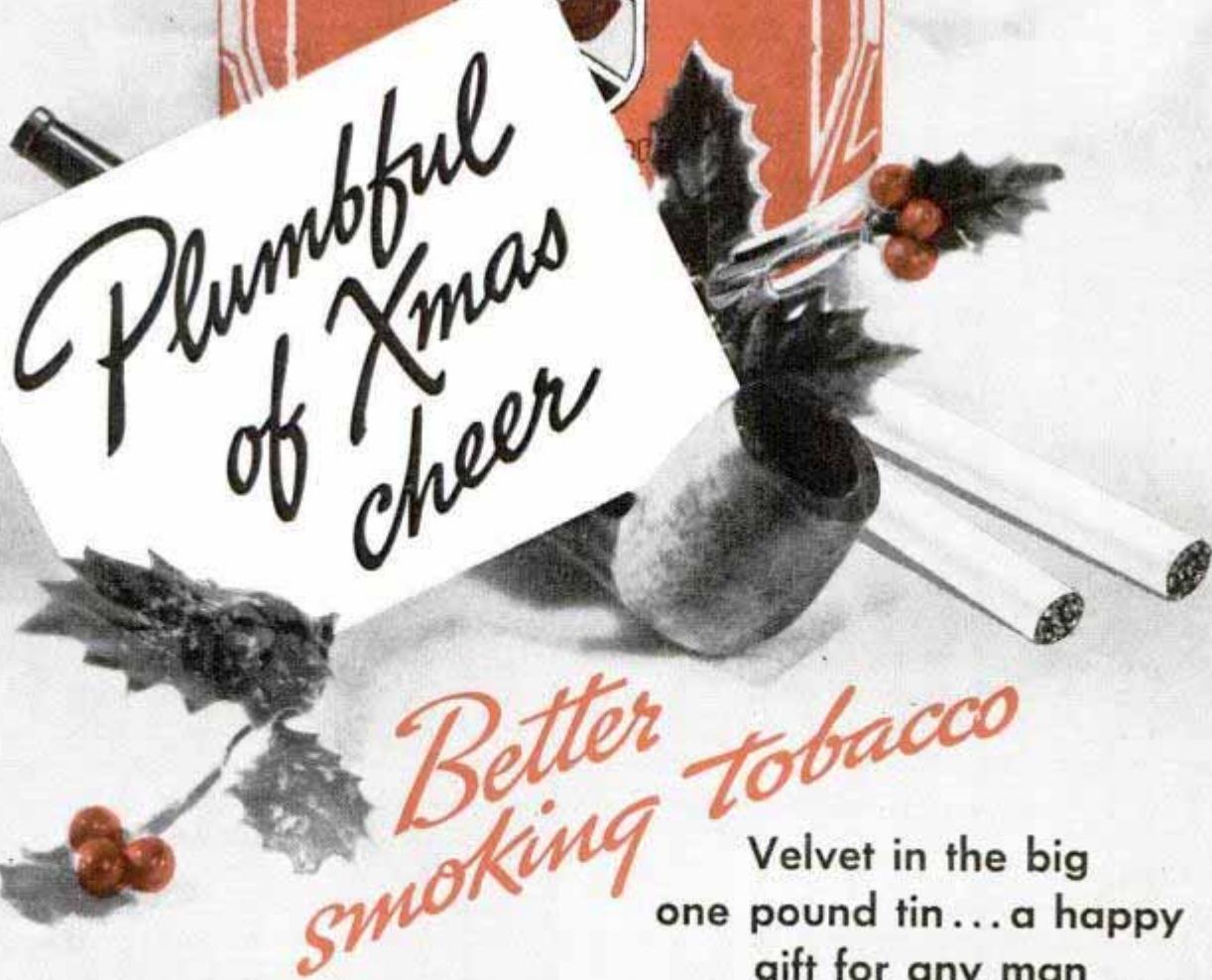
Other problems that the engineers are working on are the sturdier crankshafts needed in supercharged engines, valve materials that will stand up under the higher exhaust temperatures, and spark-plug materials that are efficient over the wider heat range. The possibility of driving the supercharger from a small turbine operated by the exhaust gases is one intriguing idea.

Because laboratory tests of many kinds don't always prove themselves on the open highway, the Ethyl Gasoline Corporation recently opened an experiment station at San Bernardino, Calif., where new automotive materials and designs are tested

under actual operating conditions. The station is adjacent to mile-high mountains and sub-sea level areas. Freezing temperatures at high altitudes and the blistering heat of the desert only a few miles away provide a wide range of driving conditions. On the level surfaces of dry lakes in the desert, cars can be driven wide open as long as they will hold together. About twenty vehicles ranging from passenger cars to heavy trucks and trailers hauling 60,000 pounds gross load are used continuously in the test work. One truck alone has consumed 72,000 gallons of fuel in tests so far.

Drivers and engineers, working in shifts, are apt to drive a passenger car 1,000 miles per day for eight months or more. Each car is equipped with special instruments and with burettes for measuring fuel consumption. The old way of comparing the performance or economy of two different gasolines was first to make a test run with one fuel and then repeat the test over the same route while using the second fuel. But with this method the atmospheric pressure, humidity, or road conditions might change between runs and the results would not be strictly comparable. This is avoided at the San Bernardino station by testing both kinds of fuel in the same engine at the same time. Two separate fuel systems are used. Fuel from one tank runs through its own carburetor and manifold system to three cylinders of a six-cylinder engine and the other fuel feeding through a separate system supplies the other three cylinders. This allows the engineers to make scientific comparisons between an unknown fuel and a test fuel under actual operating conditions.

To a great extent the San Bernardino laboratory is a proving ground for the engines that we will be driving three or four years from now. Spark plugs, valve materials, fuels, carburetors, and new designs of intake manifolds and combustion chambers are tried out. Supercharging pressures and compression pressures are studied. Not many years ago valves had to be ground every 6,000 miles or so, today 25,000 miles at least are expected between valve grinds, and some of the tests at San Bernardino suggest that in the future valves will last for the life of the car.



Better
smoking tobacco

Velvet in the big
one pound tin... a happy
gift for any man

Heroes of the Coast Guard

(Continued from page 895)

amidships, but its crew of seventeen and their rescuers were safe on shore.

So a coast guardsman on vacation became a hero. Chief Boatswain Anderson and the five who accompanied him on the last rescue trip—including Christoffson, who also made all four trips—were awarded the Congressional medal for heroism.

Glamorous to read about, this hero stuff. Maybe that's why coast-guard careers are in such demand. You can't get rich in the service, yet there are enough applications on file to fill the coast-guard stations for perhaps ten years. That doesn't mean recruiting is closed. It's a competitive service, and the best men win. To start with, you must be between eighteen and twenty-five years old and a citizen of the United States, with a high-school education. You must prove you can swim, undress under water, qualify for rescue work and carry a victim on your back for fifty yards in the water, and retrieve a twelve-pound weight under twelve feet of water. Then, there's navigation to learn, signaling by flag and by lights, firearms drill and so on and on.

At the "Old Chicago" station the weekly routine includes motorboat drill on Monday, oars on Tuesday, code communications Wednesday, beach gun or surfboat or infantry drill Thursday, resuscitation, frostbite treatment and fire drill Friday—and Saturday is housecleaning day. The surfboat drill is a sort of vestigial reminder of earlier days; oars are virtually obsolete for actual lifesaving work but practice is kept up for emergencies, for exercise and for fun. One of the big events in the guardsman's year is the inter-district surfboat race, an elimination contest in which six-man crews from stations throughout the country participate, manning heavy nonsinkable twenty-six-foot boats.

When John Anderson was a youngster of seventeen looking forward to a coast-guard career, a strong arm and an iron back really meant something, for there were no gasoline engines in the service then. A fellow had to row or stay ashore. Today the rescue work is motorized. Fast speedboats are ready to race to the scene if waters are calm. Heavy, sturdy boats that can do only ten or twelve miles an hour stand by for squall duty. These big, self-bailing boats might capsize in a vio-

lent storm, but hang on tight—there are several hundred pounds of lead in the keel and the ship will right itself.

Weekly arms practice at the lifesaving station means not only target shooting with sidearms but firing the beach gun, which flings a nineteen-pound projectile carrying a line to the distressed ship, and the smaller rifle which is carried on the power boat and shoots a lighter line.

Next thing to be added to the curriculum will be rescue drill with two-way telephones. Fifteen stations on the Great Lakes are tuned in on the emergency frequency at all times to catch distress signals, and even lifeboats may be equipped with telephones to facilitate communication between boat and headquarters while on duty.

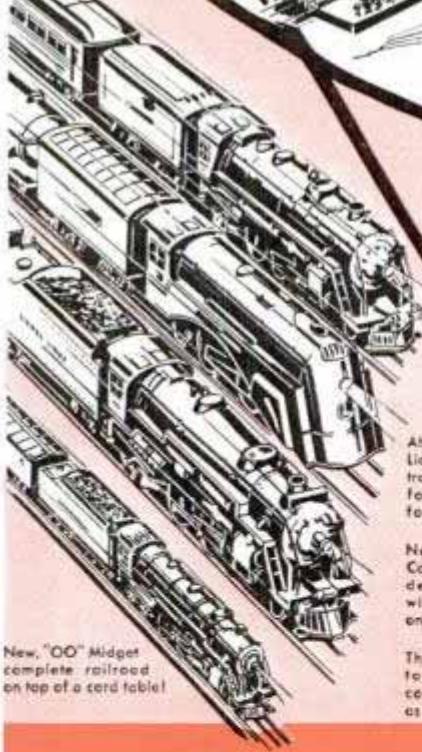
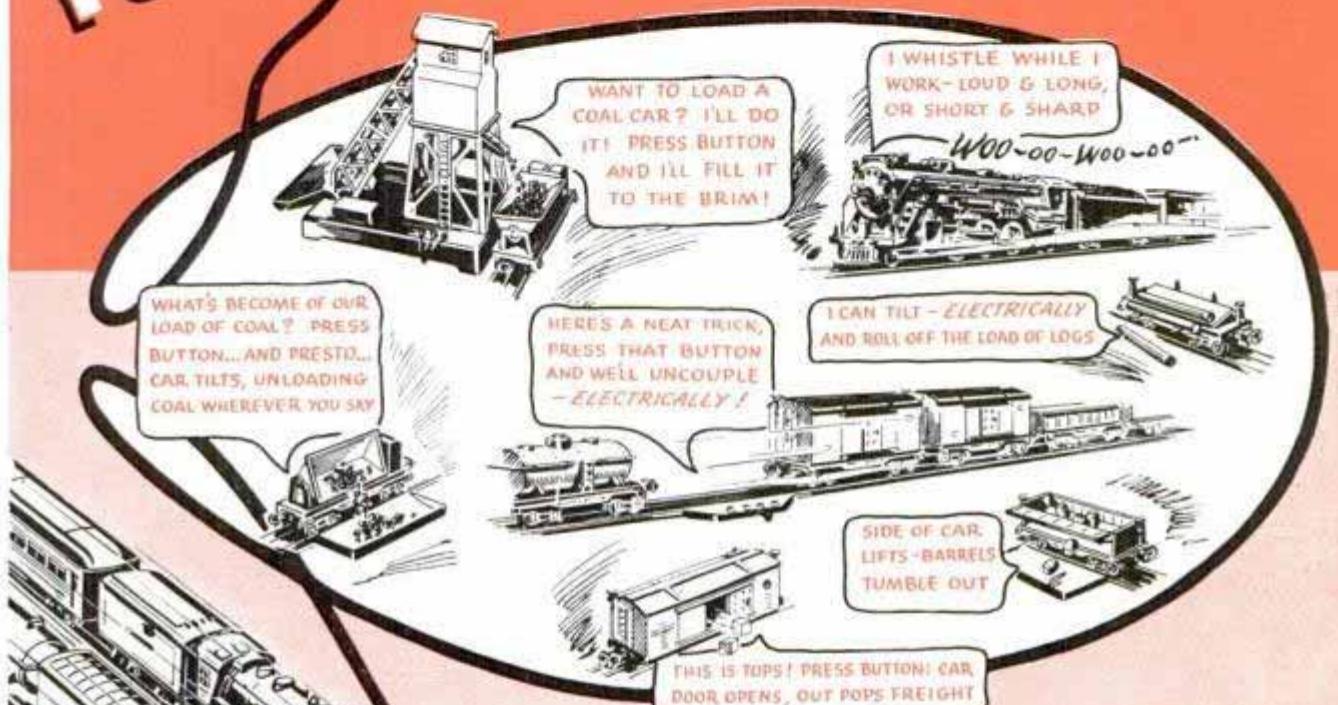
Chief Anderson has been credited with saving more than 4,700 lives. Only a dozen or so of those rescues stand out as thrilling adventures. And when you're out on a job you're not thinking that you're a hero—you're thinking that your back aches and your arms are throbbing, the frozen spray is drilling your face like needles, you haven't enough strength to climb in if the boat turns over again, and it would be nice to have a cup of coffee.

There wasn't an ounce of glamour in it that cold morning when the Chicago crew was sent after a drifting army scow. The routine report of the chief tells the story:

"At 3 o'clock Sunday morning lookout reported ship adrift and tumbling in waves half mile off the lake shore. Wind between fifty-five and sixty miles an hour. Sea bilowing waves from twenty to twenty-two feet high. With eight men put out in lifeboat 'Storm Warrior.' Got contact with derelict at 3:30 a.m. Got towline aboard derelict. Force of wind and waves made towing impossible. Scow and lifeboat bounded over high sea with no control possible. Lifeboat crashed at mid-starboard against bow of scow. Stove in lifeboat. Gap two feet square. Had to plug with jackets—even underwear—of crew. Buffeting of lifeboat and scow continued. One crew-man's leg caught in towline slack and when it tightened suddenly, leg almost amputated. Signaled for aid. Tug came out, took us all in tow. Returned to station without further mishap."

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*...a message for men
with a technical slant*

Engineers of the Army, Navy, Utilities and the Automotive Industry have long advocated the use of "Prestone" brand anti-freeze . . . the original anti-freeze with an ethylene glycol base.

The general public, too, has become well acquainted with the superiority of "Prestone" anti-freeze. It has been used in more cars than any other brand of anti-freeze ever made.

But not everyone knows *why* "Prestone" anti-freeze is so vastly superior. For "Prestone" anti-freeze is *far more* than highly refined and purified ethylene glycol. It contains other *vital* elements.

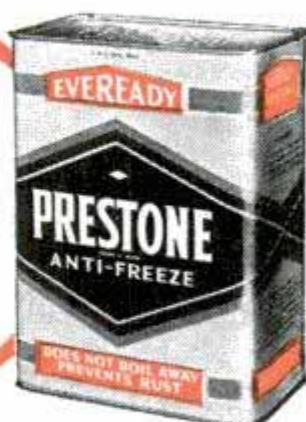
To make ethylene glycol adaptable to cooling system service required years of exhaustive research by National Carbon Company, Inc. It required millions of the most murderous miles of test driving an anti-freeze can undergo.

Out of this research and testing were developed *exclusive* ingredients that fortify ethylene glycol—curb leaking, foaming and rust-clogging—and make "Prestone" anti-freeze *unlike any other product in the field!*

"Prestone" brand anti-freeze contains NO alcohol . . . NO glycerine. It will not boil off. One filling lasts all winter long. There's no danger from fumes . . . or from fire . . . no danger of harm to your motor. Absolutely odorless. "Prestone" anti-freeze is *guaranteed in writing*. See your dealer today.

**NEW
LOW PRICE**

\$2 65
PER GALLON



The word "Prestone" is a registered trade-mark of National Carbon Co., Inc.

"PRESTONE" ANTI-FREEZE

9/9/49 Accident Sleuths of the Highway

(Continued from page 862)

Working in cooperation with the accident investigators is a camera car with a platform on top from which motion pictures are made of traffic flows and average tendencies on the part of drivers. These pictures are likewise studied and their findings incorporated into future designs.

"In this way," explains Commissioner Sterner, "the principal causes of the majority of accidents on each type of road can be ascertained. This, in turn, permits various preventives to be prescribed, such as



Camera car of accident laboratory films traffic movements while observer counts passing cars

divided highways, white reflecting curbs, traffic signals, and highway lighting.

"Where an existing road is to be widened, or divided, these studies carried on before and after the construction changes enable us to determine the effect on the number and type of accidents produced by the corrective measures. When the surveys are completed, we'll be in a position to predict the proper type of safety features required in other roads of similar characteristics to provide the utmost in safety."

Although still in the experimental stage accident laboratories have become a significant factor in checkmating highway tolls. A seven months' check of a stretch of Route 25 when the New Jersey program was begun showed eight persons killed, 234 injured in 261 accidents, of which 134 occurred at night. Traffic on this section averages over 50,000 vehicles a day. After the installation of precast safety islands, reflecting curbing, and modern highway

lighting the investigators made a second survey covering the same seven months a year later. Despite a greater volume of traffic, the number of accidents was reduced from 261 to 160, the number of injured from 234 to 149 and the number killed from eight to none.

Trained accident investigators have become important cogs in the safety machinery of virtually all the larger cities, including Providence, Lincoln, Columbus, New Haven, Oakland, Louisville, Syracuse, New York City, Detroit and Kansas City.

In the city, the accident report is spotted on a large city map by a colored pin—a white one for an accident in which there's been no fatality or injury, green for a crash involving a non-fatal injury, red marking a death.

When four pins show up at any point on the map during a six-month period, the reports are hauled out, and a map showing the details of the four crashes together with location of traffic control equipment, road conditions, obstructions to visibility, and other points is prepared. From experience, safety engineers have learned that seventy-five per cent of accidents occur during one-twelfth of the day, so the location under study is checked to learn its peak accident time. The map and data may point to a functional weakness in the street. A sharp curve may need straightening or a passenger zone must be constructed. If, however, no engineering defect is apparent, attention is focused on the motorists' habits. They may be going too fast for conditions. The fault may be indifferent observation of stop signs and signal lights, failure to give signals, making improper turns, or parking dangerously.

As soon as the cause of the accidents is determined, law officials try to eradicate it by selective enforcement. This amounts to concentrating traffic police at the danger spots. Usually, motorists are warned first of violations of traffic laws at these danger spots. "Repeaters" usually draw a ticket, a jail term, or suspension of driving privileges. Selective enforcement has even cut down the number of collisions at spots where some major alteration, say, under and over passes, must eventually be added.

(Continued to page 122A)

J 749

(Continued from page 121A)

In a number of cities as much as eighty per cent of the motor vehicle enforcement activities is concentrated on danger zones. For example, the 300 state police in Texas couldn't cover intensively the 22,000 miles of highway. They've done the next best thing, building their network of enforcement around the reports of the accident investigators. And they've made it work. Deaths on the thirty-mile stretch between Dallas and Fort Worth were cut from twenty-four to four in a year. On nineteen other experimental stretches, the 1938 toll was pared to 134 from 315.

The causes of some accidents aren't always readily apparent. At one intersection in Kansas City, four accidents occurred within a few months. The city's traffic engineer, T. J. Seburn, got out a copy of the spot map for the previous six months, found no accidents had taken place at this intersection. He prepared a collision map, went out to study the location and put his finger on the cause: a clump of shrubs in one corner of a parkway was robbing drivers of visibility as they approached the corner. From November to April when the shrubs were bare, the obstruction was negligible, hence the absence of accidents. He had the

bushes set back some distance and since then no crashes have been reported.

Scientific reporting of accidents brought about another traffic innovation in Kansas City. The city's motor toll for 1937 and 1938 showed 140 deaths, 105 of them at night, and ninety of them pedestrians. A close study made it clear that the big majority of night accidents were occurring on through streets that had a maximum speed limit of thirty-five miles per hour. In the light of these findings, a night speed limit of twenty-five miles per hour was put in effect, and six months later the city's motor toll was eighteen, as contrasted with forty-two for the same period the year before.

"When engineers first began building bridges," says Seburn, "they didn't know much about stress or strain. By making thorough investigations of projects as engineering progressed they were able to arrive at certain conclusions that removed the guesswork from bridge building. That's what we're trying to do in traffic work. Because of the human element present, traffic engineering will never become the exact science that bridge building has, but as soon as we learn what causes accidents the better we'll be able to meet the challenge our roads and highways present."

J 738

Ambulance for Crippled Ships

(Continued from page 852)

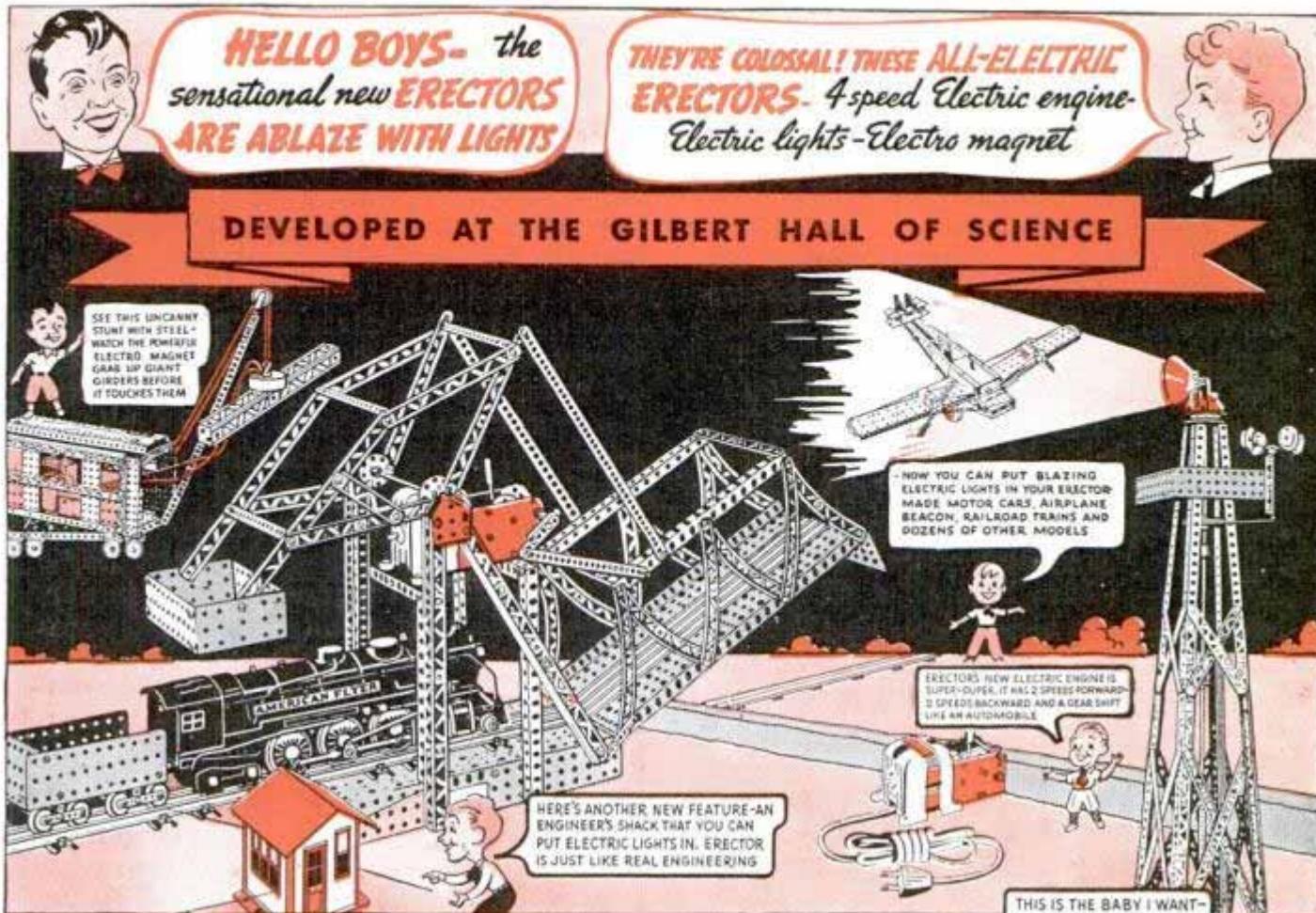
passes to the insurers. Salvage operations are conducted on a cost plus or bid basis with the owners.

Hauling ships off the rocks and towing disabled vessels to port may seem an adventurous occupation but it doesn't appeal that way to the men on the "Retriever." "Adventure?" one of them asks. "There's not much adventure in spending three solid days doing nothing but unload fish that have been dead too long. That's what happened when we patched up the 'Sea Tern.' She had gone ashore on the Mexican coast. Her ice machine was broken down and she had 120 tons of tuna on board. They were more than ripe by the time we got there and we had to throw them overboard by hand, fish by fish. The vessel had a big hole stove in her. We put on a wood and canvas patch, pumped the water out, and towed her in."

When the "Olympia," another tuna clipper, blew up on the other side of Cape San Lucas in the Gulf of California it looked like a hopeless job. Three men were killed when the engine room exploded, the deck and deckhouse were blown to splinters, and a big hole torn in the bow. The ship sank in sixty feet of water, but the "Retriever" brought her home. The crew sank large steel pontoons alongside the wreck and the diver secured them in place with a sling under the hull. Compressed air was fed into the pontoons and the wreck slowly rose. Then the salvors patched the hole in the bow, pumped the ship out, and towed it home.

Not long ago a tuna clipper capsized, the sea washed her in toward the beach and opened up her deck seams. When Captain Brown got to the wreck it was partly un-

(Continued to page 124A)



BOYS!

Leading toy stores are showing a sensational new kind of Erector this year. An Erector that makes model-building more fun than the movies—more exciting than a football game. Because Erector has gone *all-electric*.

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(Continued from page 122A)

der water and he put suction lines aboard to pump her out. It didn't work; the pumps couldn't keep up with the leaks. Then Brown had an idea. There were a few sacks of rice in the wreck and the rice had swollen up in the sea water, just the sort of thing that an experienced salvage man wants in such a case. The crew scattered the rice in big handfuls in the water at the points where the sea was leaking in. The rice filled the cracks and stopped the inflow of water enough for the pumps to win the battle.

Nearly every salvage job is different but they all have one thing in common—every job is dangerous. No one on the "Retriever" has ever been hurt although the men have had many narrow escapes. The west coast is an inhospitable shore with few safe harbors. Along the Mexican coast hurricanes are apt to strike in the summer and in the winter the local "chubasco" storm is a big hazard. This queer storm generally strikes at night, out of a clear sky. The only warning is a play of lightning on the horizon, followed by a tremendous wind.

The men on the salvage tug live hard and work hard but occasionally they have time for sport. "Ever catch a flying fish with nothing but a big soup strainer?" asks Captain Brown. "They are good eating. Down at the Galapagos, when we want some, we shine a light on deck at night and they come swimming around the boat. You can scoop them up out of the water with a soup strainer borrowed from the galley.

"Sometimes in calm weather we run into a big school of turtles sunning themselves on the surface. If we want a change of menu we shoot one from deck and put a skiff over the side to haul it in. We'll have turtle soup that night and turtle meat as well."

The "Retriever" herself lost her rudder one time 350 miles offshore and Brown had his own rescue to handle. He did it by slinging a two-ton anchor over the stern at the end of a long line suspended from an overhead boom. Then he rang the engine room for full speed ahead. The anchor trailed out astern and created a drag. When the boom was held amidships, the anchor was right in the wake and the ship steered straight ahead. By hauling the boom to starboard the anchor was pulled to the right and the ship turned in the

same direction. To change course to port, the boom was swung to the left.

One strange rescue the "Retriever" made happened when a big wooden purse seiner was rammed off Huntington Beach, twenty miles down the coast from Los Angeles harbor. The vessel was cut clear to the center line and the hole was too large to patch. The stern was awash and the bow was resting on the bottom, the heavy engines holding her down. Brown passed a tow rope around the stern and dragged the boat home under water, the bow bumping along the bottom all the way.

One of the most unusual rescues in Brown's experience happened one September when he sighted a small power cruiser wallowing out of control in the sea ten miles off the coast. There was a man on board the power cruiser and he wanted a tow to port but first, he called, he would like something to eat.

"What's the matter?" Brown shouted back. "Can't you wait a couple of hours?" "I've been adrift since last May," came the faint reply, "and I'm down to a handful of dried beans." After he was fed he explained what had happened. He lived in Alaska and the previous spring he had started out in his boat from Dutch Harbor to Juneau. Half way there his engine broke down. He started to drift and kept on drifting, the currents carrying him down toward Hawaii and then setting him over toward the mainland. He had been at sea for 117 days, had drifted across seven or eight steamer lanes but had sighted only two distant ships in all that time. His engine couldn't be repaired with the tools he had on board, his rudder had broken, and when he tried to rig a sail the small mast snapped off. He had lived frugally on the small stock of provisions on board and caught drinking water off the roof of the cabin every time a rain squall struck. In his 3,000-mile drift he weathered severe storms and came out of his remarkable experience with nothing worse than a big hunger.

Between rescues the "Retriever" lives a varied life, towing barges up the coast to San Francisco and Seattle or acting as tender to square riggers sailed for the motion pictures. But always the ship is ready for a salvage call whether it is ten miles or 3,000 miles away.

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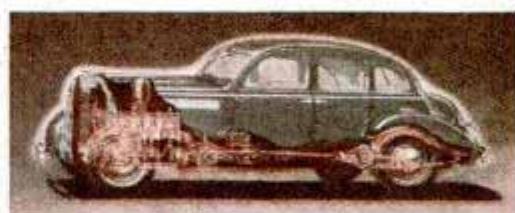
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Winter Mobilgrease helps protect vital parts against wear.



WINTERPROOF TODAY AND CHANGE TO—

MOBIL OIL ARCTIC



Public Enemy Number Zero

(Continued from page 869)

Telegraph, telephone and power companies must also mobilize their forces; but theirs is a defensive battle, for there is little they can do about snow or ice until a break has occurred in their lines. With extreme cold these utilities have little worry, for dry or wind-driven snow has no effect on wire lines. But let the temperature hover around the freezing point, with precipitation but no wind, and there is trouble. Wet snow can build up around a thin wire to the size of a water main. Wires in Springfield, Mo., a few years ago, accumulated a deposit seven inches in diameter, weighing fourteen ounces to the foot. Many wires came down, carrying poles with them.

When the upper air is above freezing so that rain falls, while the ground temperature is below thirty-two degrees, we have an ice storm. The rain freezes on everything it touches, especially metal. If the air is still, the ice coating may become several inches thick. And ice is heavy. Telephone wires in a sleet storm in Worcester, Mass., received a three-inch deposit of ice, which weighed 800 pounds per wire between poles. Wires and poles came down.

The utility companies can only watch for the break, testing lines constantly to make sure they are open. When one goes out, the distance to the break is ascertained with a Wheatstone bridge, which measures resistance. A trouble-shooting truck, or a motor car if the lines parallel the railroad, is dispatched to the scene of the break. A simple interruption can be repaired in a few minutes. If a whole section of pole line goes out at once, the problem is greater. Tangled wires must be cut down, poles removed and the circuit restored by running twisted pairs between undamaged points, stringing them along the ground, fastening them to fences, trees, anywhere — anything to restore service. When all wires go down, so that a community is isolated, a portable emergency radio telephone may be used to bridge the gap.

But the most thrilling battles come when zero clamps down hard, when lakes and rivers and harbors freeze. Then the Coast Guard is besieged with calls for assistance. A cutter is wanted to break a channel, to

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(SEE PAGES 120a and 131a)

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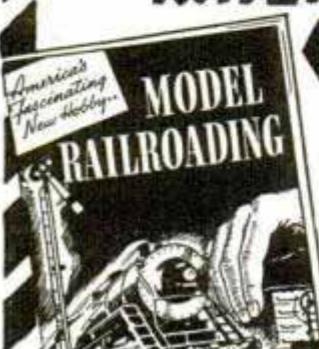


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clear a harbor, so that ships laden with food and fuel may be brought to city dwellers, so that fishermen may be freed from ice, so that medical attention may reach some isolated community. If wind and tide are right, it is sometimes possible to clear a harbor of ice in twenty-four hours. The cutter starts at the outer edge of the field and rams it, breaking off triangular sheets small enough to drift through the narrowest passage. Then when wind and tide are right, the cutter begins at the lower end and pushes the sheets to seaward until the central part of the harbor is free. At high water the cutter works along the margins, loosening shore ice, which the ebb tide carries away.

But when conditions are adverse, the same cutter might spend a week breaking a single channel only twenty miles through heavy ice. This strenuous work is an emergency measure, done only when it is impossible to break up the ice field and move it out.

The Coast Guard has two types of ships designed especially for this work. The first, the regular type cutter, has a spoon-shaped keel at the bow. If the ice is too thick to break aside, powerful engines push the bow on top the ice, so that the weight of the ship can break the sheet downward. The other type, designed especially for ice breaking, is hardly more than a large tug of extremely sturdy construction, and with powerful engines. This ship has a sharp reinforced bow, with ballast tanks forward, and a bulging projection a few inches below the water line. Charging an ice field, the projection rides on top the ice and breaks downward, while the true keel cuts with a forward motion. The combined action cuts with a sort of scissors motion.

Another form of ice work is the freeing of vessels that have frozen in at their moorings or in open water. This happens frequently to small fishing craft.

Winter's end finds the ice patrols preparing to set forth to guard the shipping lanes, so the battle against Public Enemy Number Zero is never ended.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



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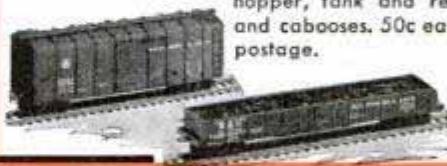
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Clear Track Ahead

(Continued from Colorado Section)

freight and passenger service the dead weight of passenger and freight cars has received considerable attention. By the use of high-tensile steel, alloys and aluminum, the weight of the new streamline trains has been reduced materially. Boxcars made of alloy steel and weighing approximately 8,000 pounds less than the previous standard cars are undergoing tests.

In steam-locomotive construction remarkable improvements have been made. Their net effect has been to increase the tractive power while maintaining or reducing weight and fuel consumption. The extension of engine runs from 100 miles to more than 500 has made for permanent

economies in shop and maintenance work. On road and laboratory tests in air-brake equipment alone, more than \$2,000,000 has been expended. From these tests has been evolved an air brake which requires only eight seconds from the time the engineman operates the brake valve until the brakes are set on the last car, as much as a mile and a half away. Tests are continuing, in an effort to develop still better brakes for use on high-speed passenger runs.

Today, the Association of American Railroads has 173 committees of technical experts constantly studying all phases of railroad operation to increase efficiency, effect economy and promote safety.

As one result of all this research, the operating cost of producing a ton-mile of freight went down from \$10.78 in 1921 to \$6.75 in 1935, a decrease of approximately forty per cent, while at the same time, the average speed of freight trains was increased sixty-one per cent. In 1938 the average distance per freight train per day was 398 miles, against 247 in 1920, including all delays en route. Because of this, California fruit growers are now four days nearer the Eastern seaboard than formerly, with service from Florida and Texas also bettered.

The railroads, today, move a ton of freight one mile at an average cost of less than one cent, the lowest rate in the world. Surely this could not have been accomplished if railroad managers were sleeping at the switch.



Above, "face" of newest Diesel streamliner, North Western's "400." Below, Southern Pacific cab-front locomotive

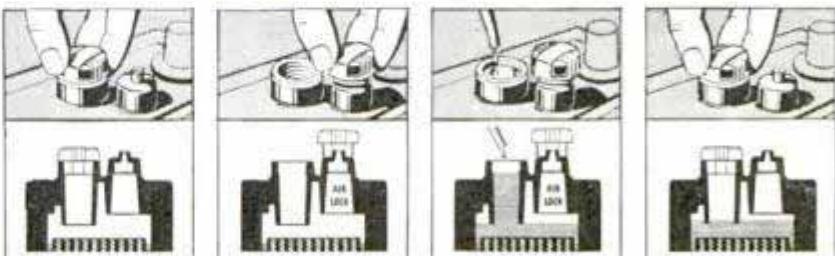


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Exploring a Tropical Wonderland

(Continued from page 837)

arms and becomes an adult starfish having five radial arms. Investigation of marine parasites is a field in itself, the size of which is indicated by the fact that there are several hundred different parasites that live on shellfish alone, including tiny crabs that live and grow side by side with an oyster inside its shell.

Scientific discoveries are adventures in themselves but the scientists on the "Velero III" share other kinds as well. Once they rescued a crew of fishermen trapped in the doldrums at sea without food or water. On another occasion five men were rescued from a capsized sailboat.

But the normal routine of an exploration party is long hours of hard work. Each member has his program mapped out and even when the ship is under way he is busy classifying the specimens collected at the last stop. One subject of present scientific interest is the marine life of the cold Humboldt current that sweeps up from Antarctica along the coast of Peru. Part of the equipment on the ship is a deep-sea dredge attached to 7,000 feet of plow-steel cable that is used for bringing to the surface the tiny crustaceans and other forms of life that exist on the bottom.

Ashore the scientists lead a rough life. In spite of skilled boatmen a skiff is sometimes swamped in the surf. Climbing over slippery rocks or wading in shallow water, a collecting party may be submerged by a giant comber. Inland the botanists and ornithologists struggle through long stretches of cactus or slash their way through jungle growths. A day's hike may take them across miles of broken lava and thorny brush. Often they find specimens that make even the toughest trips worth while.

On several cruises parties from the "Velero III" have visited the uncivilized Seri tribe of Indians who live on Tiburon Island in the Gulf of California. Said to have been cannibals in the past, they live in crude brush shelters and feed on fish and small animals. More recently one of the expeditions brought back an excellent photographic study of the San Blas Indians of southern Panama, a tribe that has had few contacts with civilization and that rarely allows its women to be photographed, believing that the camera steals the souls of those whose pictures are taken.

Dinner Time at the Zoo

(Continued from page 875)

one of the lions refuses to eat. Once a young lioness was intentionally poisoned by some visitor. For three weeks the lioness was kept alive on a diet of raw eggs and milk, which Gibson administered with the aid of a large syringe. When the lioness would open her mouth to growl, Gibson would jump forward, jab the point of the syringe between her teeth, and squirt in some eggs and milk. When the lioness finally began to eat regularly again, he counted his fingers twice, and went to see if the baby boa constrictor was getting enough white mice. The mice, incidentally, are killed before they are fed to the snakes.

Only government-inspected beef is fed to the animals. Eggs, milk and vegetables are also of the best quality, and rigorously inspected to insure against infection.

One of the most prized animals in the Griffith Park Zoo is Yogi, a dwarf Kodiak bear captured in Siberia and valued at \$12,000. Yogi is very partial to carrots. But too many carrots aren't good for bears. Therefore, her meal consists of a mixture of carrots, lettuce, and vitamin-treated bread. Bread, however, is a sort of bear spinach, and Yogi doesn't think much of it. So she sorts out the bread and piles it to one side, as a silent gesture against a balanced diet.

Monday is fast day for most of the animals. This is due to Sunday over-feeding by visitors who don't believe in signs. The other six days of the week feeding begins at ten a.m. Food is prepared in the feed house by two dieticians under Gibson's supervision. Mechanical choppers, grinders, and mixers speed up the work. A huge icebox is filled with whole beefs, iced fish, and beef hearts. Each type of animal has its own special bucket. Certain monkeys and other animals have individual buckets labeled with their names. Unusual types of food, such as the dried shrimps, which are difficult to obtain, are kept under lock and key.

The problem of furnishing food for the zoo isn't always simple, but it's an interesting one—in which science and ingenuity combine to keep the animals looking their best for the benefit of the people on the outside looking in.

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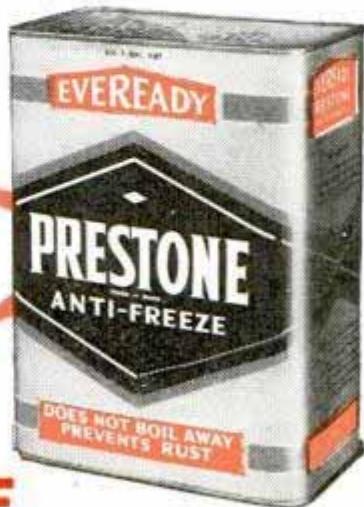


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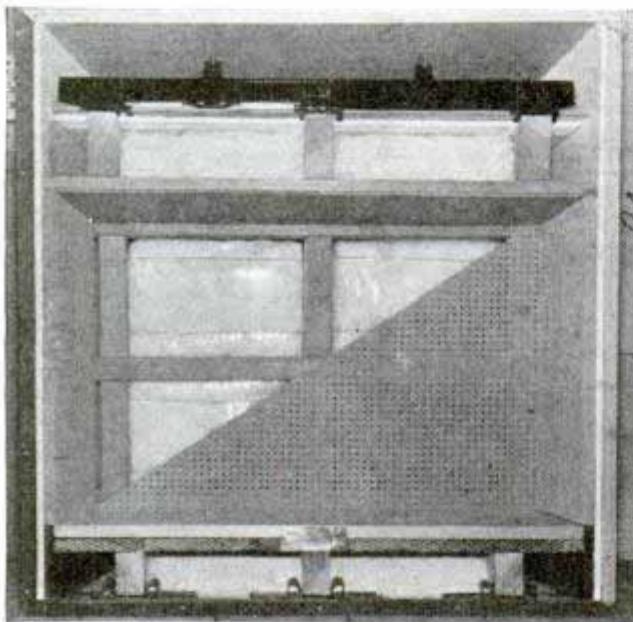
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The Golden Age of Sound

(Continued from page 830)

louder than the background noise to the ears of a person wearing ear defenders. On the other hand a person wearing the defenders can hardly speak loudly enough to make himself understood by an unprotected person in a noisy place because he doesn't realize how loudly he must shout in order to be heard.

It is estimated that several million people in the United States are noticeably deficient in hearing. Heredity, age, damage from infections, or exposure to great noise deadens the sensitivity. If you tested you



Cut-away representing radio studio where ten types of sound-absorbent materials and devices are used

hearing at the telephone exhibit at either world fair last summer you unwittingly participated in a giant survey being made to discover the extent and degree of deafness in the population, a study that is important to society as well as to telephone engineers.

Incidentally, the belief that animals have much keener hearing than humans is erroneous. The hearing of most animals is remarkably similar in range and sensitivity to the human ear although animals have the advantage of not wearing shoes and so are better able to detect sound vibrations through the ground.

Everyone is partly deaf because no human ear is tuned high enough to detect some of the sound vibrations that are created in nature. After twenty years of age we slowly begin to lose our hearing in the

upper tones. As age advances vowels can still be heard but consonants are increasingly harder to understand. High-pitched words such as "thin" and "fine" are hard to catch by the partially deaf although they still understand "low" or "gore" or other low-pitched sounds.

It is a peculiarity of sound that low-pitched tones drown out or mask high-pitched tones. This characteristic is carried over in the amplifiers that are used as aids for the hard of hearing with the result that even though speech is made louder for them they still have trouble hearing the higher notes that are required for complete understanding. This difficulty is overcome in a new English system that employs two channels and delivers all low notes to one ear and all high notes to the other. The result is that each ear hears one band of frequencies without interference. This device, a boon to the deaf, is the outcome of an old stunt of telephone engineers who sometimes divide speech up electrically and divert all the low notes to one ear and all the high ones to the other. Each ear hears distorted sound yet the brain, receiving sound from both ears at the same time, assimilates the sound waves into normal intelligible speech.

Improved as it has been, the telephone is not yet a perfect instrument and the fact that we hear so well over it is partly due to the training our ears have received. Some high and some low notes are muffled by the mechanism and some others are over-emphasized. People not accustomed to the telephone are apt to have difficulty until they train an ear to interpret the sounds, a thing that you can test for yourself by placing the receiver to the other ear than the one you usually use.

Otologists are learning that a person's two ears are likely to be quite different in tone perception and sensitivity. In the future a person who is hard of hearing will not be restricted to a simple amplifying system for only one ear but will be able to equip himself with a small portable double outfit that has been adjusted to fit the individual needs of each ear just as individual glasses are ground to fit the peculiarities of each eye. Hearing aids for both ears

(Continued to page 135A)

FAMOUS

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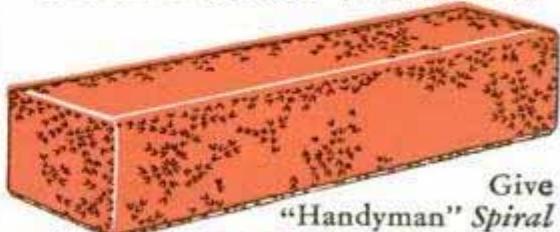
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2843
(Continued from page 132A)

are also desirable because binaural listening improves the sense of sound localization, reduces room reverberation, and increases the ability to focus attention on desired sounds.

Recently a subject with only four per cent of standard hearing ability was tested with various kinds of hearing aids. Using a portable aid of the common micro-telephone type his articulation was twenty-one per cent. With a portable vacuum-tube type his articulation was increased to forty-five per cent and with the laboratory high-quality amplifier there was an increase to sixty per cent. When this uniform amplification was modified to conform to his special needs his articulation reached seventy-two per cent. The indications are that the present imperfect listening devices for the hard of hearing are going to be replaced by aids that in most cases will allow them to hear only a little less perfectly than people with normal hearing. Unfortunately, this does not suggest that any amplifying system will be of any use to those who have suffered a complete loss of hearing because of inner ear or nerve atrophy.

The realm of music is expanding to new horizons with the development of electro-musical instruments that provide composers and musicians with almost unlimited control over timbre and harmonics. Not only can these "tone generators" of the vacuum-tube type imitate the best individual instruments but they can combine the effects of many kinds of instruments in an orchestration. One hope is that such sounds of nature as the breaking of waves and the murmuring of trees will be made available to musicians and that the newly created sounds will be made definitely musical by the use of filters that select tonal bands that form harmonic series. Modern acoustics can and should furnish the musical artist with new tone colors and new sound effects which a Wagner could utilize to enhance the beauty and emotional interest of music.

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(SEE PAGES 120a and 131a)



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Progressive Receiver

(Continued from page 937)

It would not be practical to try to cut these extra holes after any parts are mounted. These chassis bases are available, formed and drilled, from several large radio parts houses, if desired. Both the antenna and r.f. coils have four leads that are not employed in this 4-tube set, as indicated in the simplified wiring diagram of the re-

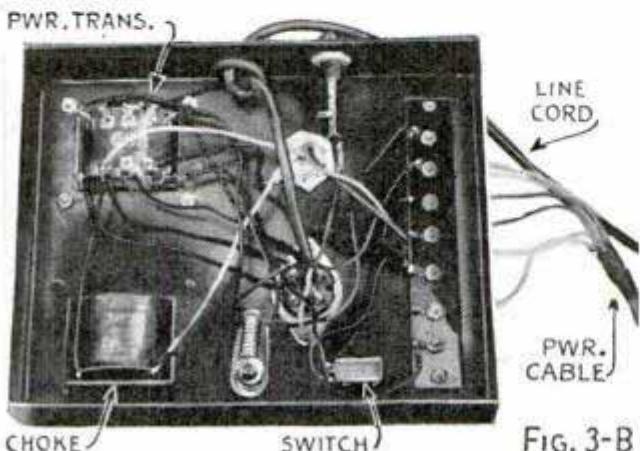


FIG. 3-B

ceiver, Fig. 4. These leads are merely twisted up and the ends taped, until required for the large set; the third section of the tuning condenser is also reserved. The coils are "General" types, the numbers of which appear on the diagram.

Metal tubes are used as they require no additional shielding and are the types com-

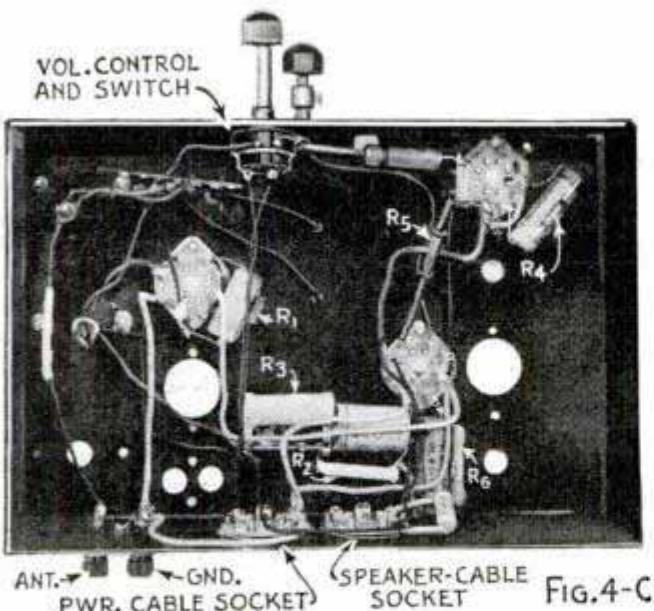


FIG. 4-C

monly employed in commercial receivers. Although this 4-tube circuit is a standard t.r.f. variety, it will be noted in schematic circuit diagram Fig. 5 that a type-6Q7 tube

(Continued to page 138A)

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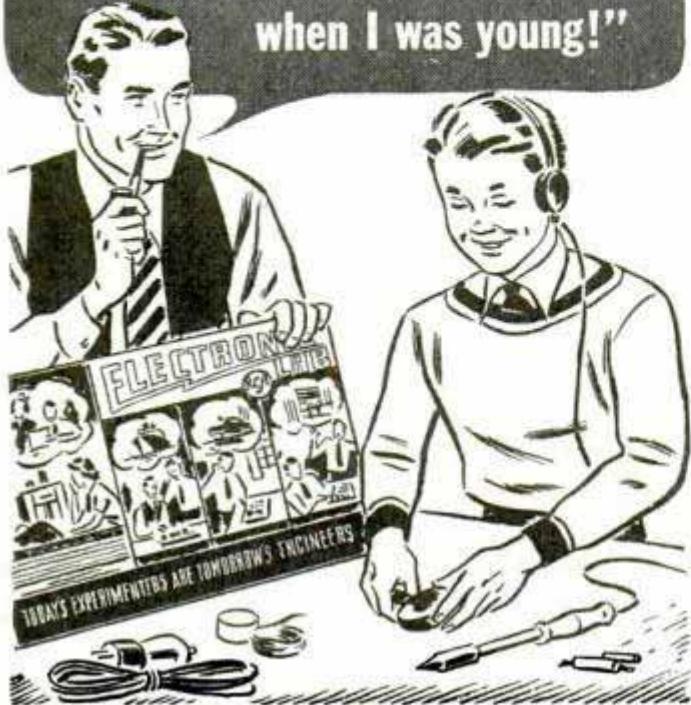
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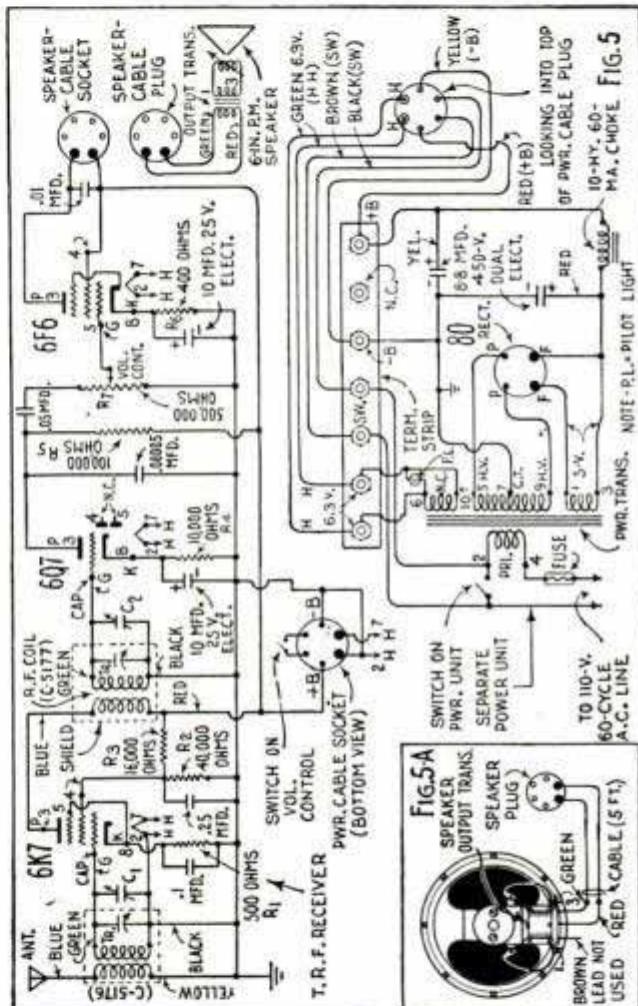
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(Continued from page 137A)

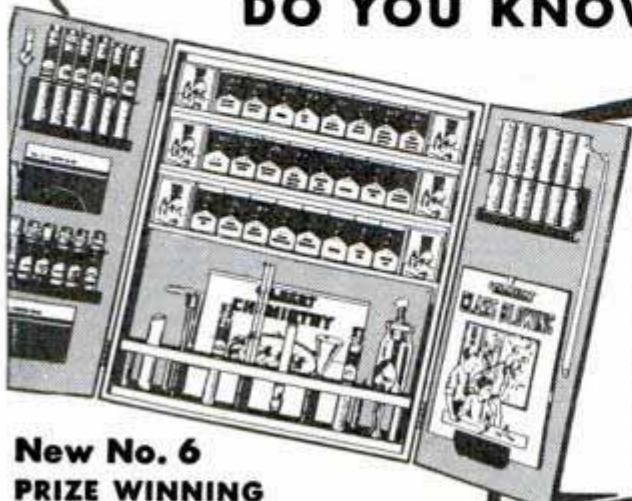
is used as a triode power detector, the diodes not being connected. A type 6K7 is employed in the r.f. stage and the 6F6 in the output stage delivers 3 watts of audio power. A detailed material list for this 4-tube set can be obtained from Popular Mechanics radio department without charge. Any good permanent-magnet dynamic speaker with the correct output transformer will work nicely. A table-type cabinet, or console, may be used to house



both the receiver and speaker if preferred; an airplane-type dial with universal scale is recommended. Photos Figs. 3-B and 4-C are underside views of the completed power unit and receiver chassis.

To balance this set, tune in a good powerful local station at about 1,400 kc. Reduce the volume until the program is barely audible. Now turn the set in the position indicated in photo Fig. 4-A and adjust the top trimmers with a small screwdriver until maximum volume is obtained. Any good indoor or outdoor antenna may be used. The blueprint number of this 4-tube set is R-273.

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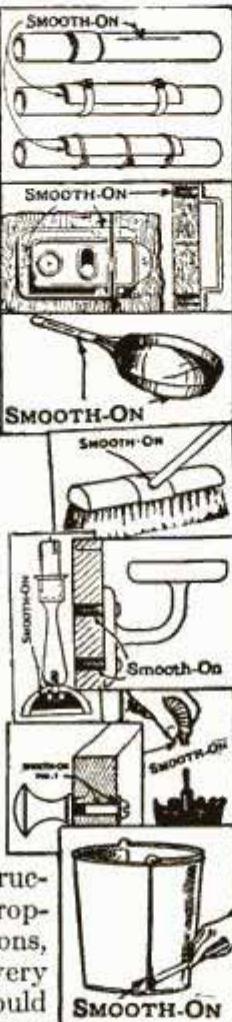
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The Movies Join the Army

(Continued from page 889)

ment—soldiers and civilians alike. Under the new plan short films of one and two reels would be made on a large scale. For the most part they would be sixteen-millimeter, amateur size, sound films that would show every type of military drill and would be made available immediately for every army training unit.

In charge of the training film program is a staff of Hollywood trained technicians who work in a tiny laboratory in the Army War College grounds. These experts run a highly efficient motion-picture producing plant containing the most modern equipment including finest sound apparatus, a couple of expert animation artists, plus a corps of directors, actors, projectionists and mechanics.

According to Major R. T. Schlosberg, U.S.A., who directs the movie unit, "The use of animated cartoons is one of the most effective methods in this ultra-modern system of education. Functional processes of equipment and precise operation of weapons can be demonstrated effectively in this manner. For example, a complete picture of what occurs inside the recoil mechanism of a big gun can be illustrated visually by no other method."

The army also maintains a training film unit, based at Fort Monmouth, N. J., in charge of Major M. E. Gillette. This unit is charged with the preparation of scenarios and the photographic and editorial work in connection with the completion of the finished training film.

Raw materials for an army movie cost from \$600 to \$700 a reel, depending on the number of retakes. When a movie has been filmed it goes through about the same general procedure in the army as it would in Hollywood. Developed, cut, edited and assembled, it will then be shown in a projection room with walls and ceilings soundproofed, while army officers, seated in red-leather chairs, look on with critical eye. Copies of each movie are sent to the various corps area headquarters.

The Signal Corps made hundreds of thousands of feet of film during the world war. This material, together with subsequent additions, probably constitutes the largest and most valuable collection of historical movies in the government service.

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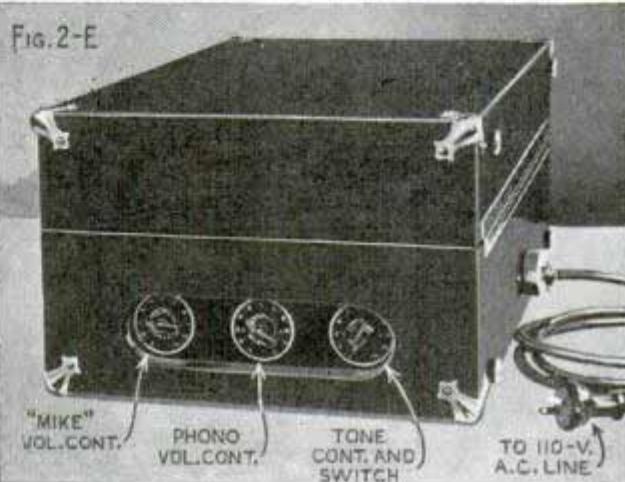
City..... State.....

Portable Low-Cost Sound System

(Continued from page 938)

tion is made by means of a recessed-type plug and receptacle indicated in photo Fig. 2-D. This socket is connected to a dual receptacle plug screwed to the bottom of the case to provide a convenient means for supplying power to the amplifier and phonograph motor, both of which are operated with independent switches.

The mounting panel detail for the phono turntable shows the location of all mounting holes, and dimensions for the phonomotor cutout to meet the requirements of



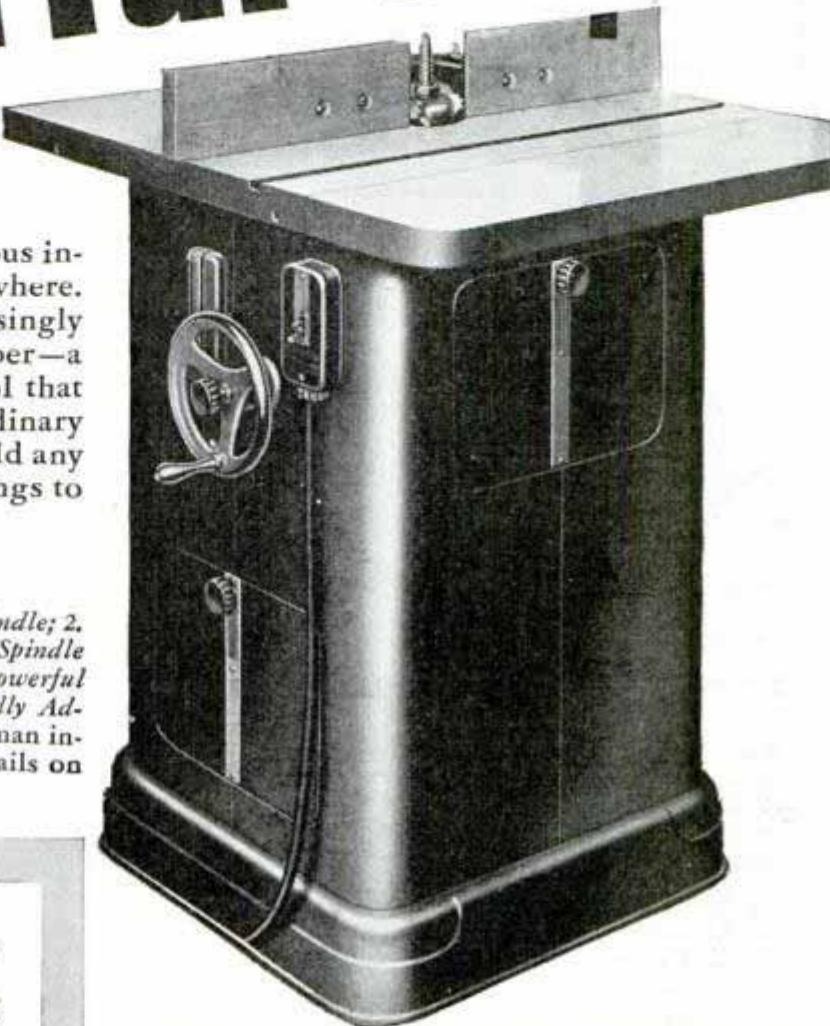
the one specified. These dimensions may be altered to suit any other type that the builder may prefer. The motor switch and auxiliary pickup gain control are also mounted on this panel in the manner shown in the photo. Soft rubber washers are used on the motor mounting screws above and below the panel to cushion the motor and turntable assembly. External connections for two 12-inch, permanent-magnet type loudspeakers with 15-ohm voice coils, and a microphone, are provided by the sockets and microphone jack mounted in the front of the case directly under the carrying handle. Sixty feet of heavy 2-conductor rubber-covered cable is provided for each speaker, the cables terminating in 4-prong plugs with connections made to the large prongs. The cables are coiled in the rear of the speaker cases when not in use. Speaker cases may be of the homemade variety shown, or similar ones are available from radio parts houses. They are provided with handles to make them easily portable. The large instrument case weighs approximately 36 pounds. Blueprint number for this article is R-272.

POWERFUL NEW DELTA SHAPER

It's here at last—and arousing tremendous interest among power tool users everywhere. This new Delta unit offered at a surprisingly low price is a basically improved shaper—a powerful, smooth-running accurate tool that gives you heavier, faster cuts than the ordinary light shaper. It will shape, form or mould any form of work from the smallest mouldings to heavy production work.

Many Special Advantages

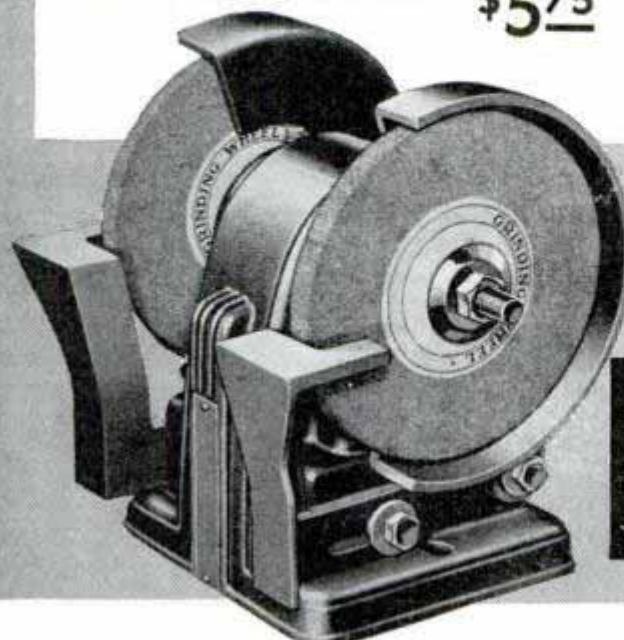
Some of its new features are: 1. Large Husky Spindle; 2. Exceptionally Big Table; 3. Long Spindle and Spindle Travel; 4. Large Sealed-for-life Bearings; 5. Powerful V-Belt Drive; 6. Interchangeable Spindles; 7. Fully Adjustable Fence; 8. Strong, Welded Cabinet. Every man interested in power tools should get the full details on this remarkable machine.



NEW LOW COST DELTA GRINDER AND BUFFING HEAD

Has 6" x $\frac{1}{2}$ " wheels, easily removable cast iron guards, adjustable tool rests and a quality heretofore not found in low-cost grinders. May be driven from back or bottom. New Delta Buffing Head is similar to grinder except that guards and rests are eliminated. Has $\frac{1}{2}$ " threads so that many standard attachments can be used such as scratch wheels, wire brushes and chucks.

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8982

Sharpshooting at Unseen Targets

(Continued from page 811)

So that the gunner can hit the invading ship, all these things must be figured out for him. Range and direction are simple problems in trigonometry and a clever device called a plotting board has been developed to solve these problems automatically and instantly.

A coast-defense fort will have base-end stations, perhaps several miles away, on either side of the guns. Usually they are placed on some high point of ground that permits observation many miles to seaward. These stations will be at known distances from the guns, and will be connected to the plotting room by telephone.

Observers at each station pick up the enemy ship with their telescopes, which are mounted over a graduated dial. Hav-



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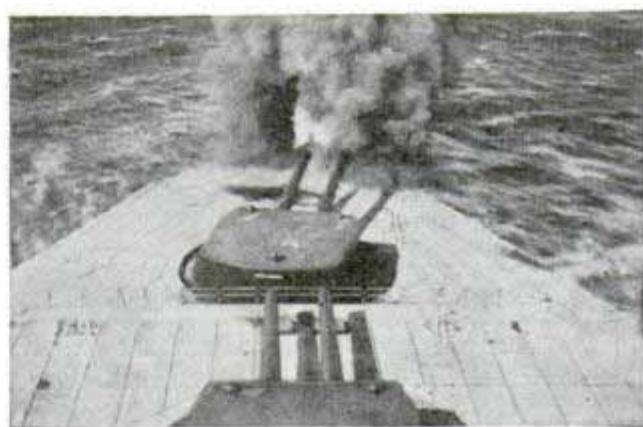
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With decks cleared for action, forward turret of cruiser hurls two shells at enemy

ing the ship spotted at the cross hairs, they read the dial pointer and phone the azimuth reading to the plotting room, where a miniature range is laid out on the plotting board. This board is a semi-circular table, graduated around its edge, and equipped with three arms, which are placed in the same proportional relationship to each other as are the two base-end stations to the guns. As the observers report the azimuths from their stations to the target, men set the arms of the plotting board to those same angles. This causes the third or gun arm to automatically point to the azimuth that the target is from the gun; while at the same time the movement of the plotting arms causes a slide on the graduated gun arm to indicate the range. Actual distance and direction from gun to target are thus read at a glance.

But this information is not enough for

2982

the gunner. A man sits at the range correction board, making adjustments for all the variables that affect range, so that when the actual range is called out to him, he need only set that range on the board to read off the corrected range, which the board automatically computes. Another man operates the deflection board, adjusting the variables that affect lateral direction. Then by setting the actual direction on the board, he can read the corrected azimuth instantly.

In the meantime the observers at the base-end stations track the moving target, reporting the changed azimuths every minute, or other interval in which it is desired to fire the guns. After four or five such reports, the plotting officer has a line of four or five dots on the plotting board, which show him the course and speed of the ship. This enables him to plot the point where it will be at the instant he desires to have the guns fired. Next he consults a slide rule to show him how far the ship will travel while the projectile is in the air, and sets this distance off on the plotted course. This gives him the set-forward point—the point where the guns are to be aimed. The correction is applied to this range and azimuth, and the information is transmitted to the guns by phone or visual indicator.

When the first shot is fired, the base-end observers' job changes. They now watch for shell splashes, and report the angle, read by a scale etched on the telescope lens, between the splash and the target. The plotting crew set these two angles on the spotting board, which automatically computes the error for that shot, in both distance and direction.

The officer at the plotting board makes these corrections in computing future set-forward points, and this procedure continues until the target is destroyed. Often ten or more shots are fired before the target is hit; but with three or four projectiles on their way at once from the same gun, spotting corrections cannot be applied until that number of shots intervene.

While this method of spotting and target location is the most accurate possible, it probably will never be used in a future war; for a modern fleet would be concealed from the shore by a smoke screen, laid down by destroyers or airplanes.

(Continued to page 147A)

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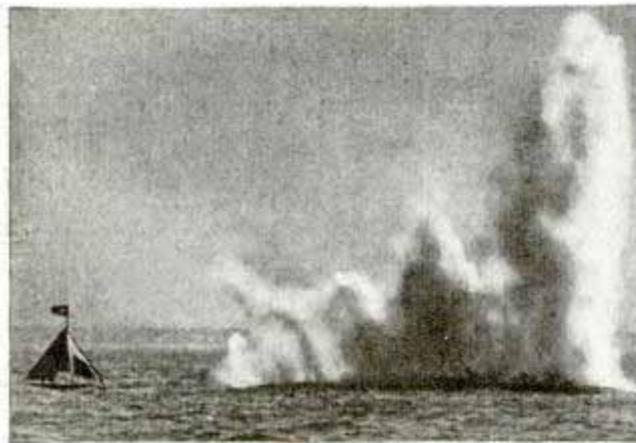
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(Continued from page 145A)

In that case it would be necessary to locate the target and adjust fire by aerial observation. The plane would first fly on the far side of the enemy ship, and radio the compass bearing of the ship from two prominent landmarks on shore. Lines would be drawn on the chart from these landmarks, at the designated angles, the location of the target being where these lines cross. The airplane observer would then determine the course of the ship, and would estimate its speed; then when the firing commenced, he would observe the splashes, reporting their location with regard to the target.

Naval gunners have exactly the same problems in firing the big guns aboard the battleships; but with added complications. For not only is the enemy ship moving, but



Four shells explode as one within a few feet of towed target, recording a hit

so is the ship from which the guns are fired. And a ship permits of no long base line from which accurate triangulation is possible. Instead, an optical range finder, with a base of only thirty feet, must be used. This instrument is so designed that when a true image of the target appears in the eyepiece, range and direction may be read direct from a scale. This information is set on an amazingly intricate machine called a director, along with data on the variables, and the courses and speeds of both ships. The director automatically and instantly computes set-forward points, and by an electrical hook-up, aims the turret guns, which may all be fired together at a touch of the gunnery officer's finger.

The roll and pitch of a ship in a heavy sea adds another complication. It readily can be seen that the guns must be aimed in

(Continued to page 149A)

J 982



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\$12.99

You can make a real income with this unit.

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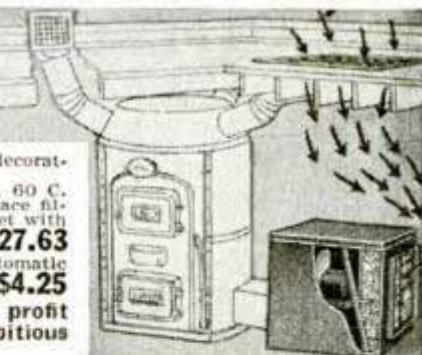
No. A3 Complete 110 V, 60 C. electric motor driven furnace filter unit complete in cabinet with Edgeseal filter pad each.....

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No. A4 Thermostat for automatic control of above, line voltage.....

\$4.25

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Catalog, circulars and prints .25 (Free with order)
\$10 UNIVEX 8 MM MOVIE Camera only \$5.95 with any order.

I am enclosing \$..... cash. Balance \$..... C.O.D.

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WIN INDEPENDENCE - ORDER NOW!

THOUSANDS REJOICE AS THEIR SKINNY BODIES FILL OUT



Posed by professional models

AMAZING GAINS OF 10 TO 25 LBS. IN A FEW WEEKS REPORTED BY MEN AND WOMEN EVERYWHERE

Thousands of thin, rundown, nervous men and women who had tried several other tonics without apparent results—who could hardly look at food, slept poorly and were always tired and jittery—report gains of 10 to 25 pounds in a few weeks, wonderful new pep, fine appetite, sound sleep, steady nerves—through simply taking these amazing little Ironized Yeast tablets.

The reason is simple. Scientists have discovered that great numbers of people are skinny, puny, tired and shaky only because they don't get enough Vitamin B and iron from their daily food. Without these two vital substances you may lack appetite and not get the most body-building good out of what you eat.

But now you get these exact missing substances in these scientifically made, easy-to-take little Ironized Yeast tablets. So it's easy to see how, with their aid, so many almost hopeless people have easily put on the naturally attractive pounds they so long wished for—have gained new strength, new pep, new friends and new joy in life.

Try them on money-back test

Get Ironized Yeast tablets from your druggist today. If with the first package you don't eat better and FEEL better, with much more strength and pep—if you're not convinced that Ironized Yeast will give you the normally attractive flesh, new energy and life you have so long wished for, the price of this first package will be promptly refunded by the Ironized Yeast Co., Atlanta, Ga.

Only be sure you get the genuine Ironized Yeast, and not some cheap inferior substitute which does not give the same results.

Special offer!

To start thousands building up their health right away, we make this special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating little book on health, "Facts About Your Body." Remember, results with the first package—or your money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 5312, Atlanta, Ga.

TUNE IN ON JOHN J. ANTHONY'S GOOD WILL HOUR. See your local newspaper for exact time and station.



new POWER JOINTER

only \$650

postpaid (Outside U. S. A. \$1.
C. O. D. \$6.75)

FREE CATALOG!

describing \$150 Prize Contest (1st prize \$25; 2nd \$15; 3rd \$10; 41 other cash and merchandise prizes). Cat. Illustr. complete power tool line: Jig Saw, \$1.50. Shaper, Circular Saw with oilless bearings, \$2.50; each; Drill Press, \$2.50; Sander, \$1; completely equipped lathes, \$2.00 and \$4.00. Sold direct only. Order today or send card for Catalog.

\$150 PRIZE CONTEST

Just think of it, a real 4" power jointer of this astonishingly low price! The Jointmaker performs every joint-making operation (planes, cuts angles, rabbits, etc.) smoothly and quickly. Weighs 8 lbs.; is overall 4 1/2" high by 8 1/4" wide by 13 3/4" long; has 4 1/4" wide table with 4" tempered carbon steel knives set in solid safety-type cylinder with automatic guard. Fence fully adjustable without tools. Frame and fence solid cast iron.

Guarantee: Satisfaction or full refund if returned within 5 days.

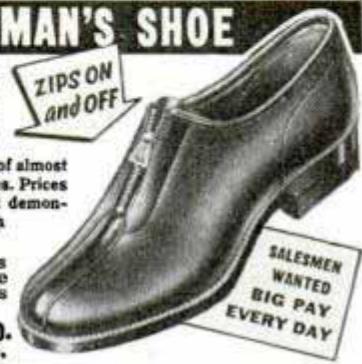
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5 Commercial St., Rochester, N. Y.

NEW KIND OF MAN'S SHOE

The new sensation in men's shoes — The Chippewa Clipper. It zips on and off in a "jiffy." Right now is the right time to get into a dignified and highly profitable shoe business of your own with this fast seller, and a complete line of almost 250 styles of dress, work and sports shoes. Prices as low as \$1.98 a pair. Free 10-second demonstrator sells super-comfort air-cushion shoes like magic.

Manufacturer established 35 years wants salesmen. No experience needed. Write for complete sales kit. It's free!

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BUILD THE SCHOONER BLUENOSE

Complete Kit

\$2.50
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Makes perfect
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CARVED PINE HULL

Metal Anchor, Steering Wheel, Lifeboats, Anchor Chain, Casks, Masts, Dowels, Lacquer and Cement.

Complete hobby catalog, 10c

IDEAL AEROPLANE & SUPPLY COMPANY, INC.
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TRAILER BUILDERS · BUYERS · OWNERS

TRAILER Send 25c for this Big Book Today

Over 100 pages. Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25c today. Satisfaction positively guaranteed!

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BUILD IT YOURSELF

The Jim Dandy Cabin Cruiser
The Trailer that has everything. Classy! Roomy. Easy to build in any size with my simplified Plans and Instructions—Price \$1.00. Rush dollar bill today to JIM DANDY Box 125-A WAUSAU, WIS.

PEPY CASOLINE ENGINE GOVERNOR

 Make your Auto, Truck or Tractor Motor into a steady, even power unit for all kinds of work. Fits any make of engine. Money back guarantee. Price, postpaid..... \$9.50

Harris Machy. Co., 505 30th Ave., S. E., Minneapolis, Minn.

BUILD YOUR GRANDFATHER CLOCK

The Simple Sensible Red-i-Kut way as thousands have. DIME brings PLANS and sixty picture "HOW" Book pricing many fine brass weight Westminster, tube chime, electric and battery movements showing nine beautiful colonial grandfather cases. WHY WAIT LONGER?

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ENGINES

A real **money maker** for farm or factory. Uses Cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.



LOG SAWS

Make Money—Start a wood sawing business—turn spare timber into cash. Cash or Terms—Engine and Saw Catalog.

WITTE ENGINE WORKS 1749 OAKLAND AVE.
KANSAS CITY, MO.

(Continued from page 147A)

relation to the surface of the earth, rather than the ever-changing angle of the deck, else ranges become meaningless. To compensate for roll and pitch, the navy has perfected a mechanical device which corrects for the ship's motion at the instant of firing. These marvelous devices are among the navy's most guarded secrets; no one ever being permitted to see them except those entrusted with their operation.

The fleet carries its own observation planes, either on carriers or on catapults of the fighting ships, to locate the enemy and to adjust fire by observing the splashes.

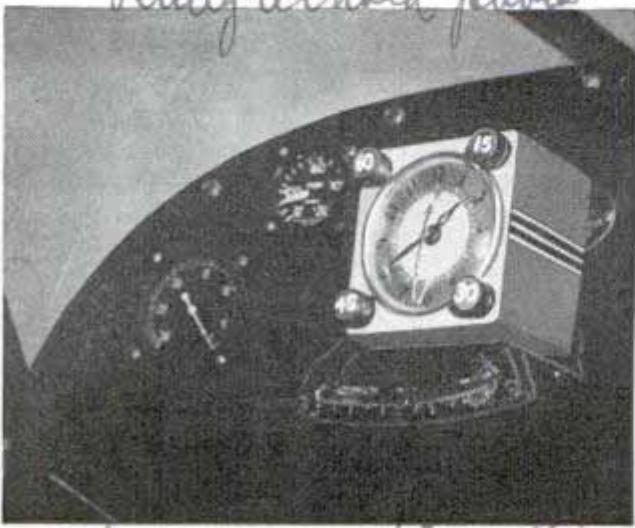
The problem of field artillery that accompanies the mobile army is simpler in well-mapped country, for with gun and target accurately located on a map, the direction and range can be read directly, using a protractor and map scale.

But maps suitable for fire-control purposes are available for only a small portion of the earth's surface. And without such maps, every artillery problem becomes a complicated computation in trigonometry, for field artillery cannot carry the cumbersome and delicate instruments used by the navy and coast artillery to solve their problems mechanically.

2107 Alarm Clock for Flyer Rings Bell When Rental Period Is Up

Pilots who rent planes by the hour from one operator at Floyd Bennett field can no longer offer good excuses for staying in the air beyond the time limit. In the cockpit of each airplane is a "flying time" alarm clock that rings a bell as soon as the specified rental time is up. Four control knobs are used for marking fifteen, thirty, forty-five and sixty-minute periods.

Nudy Arnold photo



*Mr. Archie Baxter
of New York*



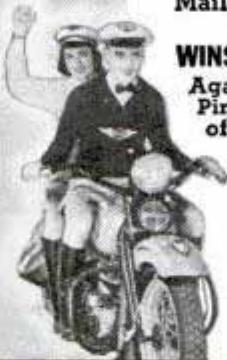
motorcycle to "FUNLAND"

WHEN you own a 1940 Harley-Davidson Motorcycle, every day brings you new exciting adventures. Its zooming power and streamlined beauty constantly open new gateways to fun! You're always "all set" to go places — see new sights — make new friends — and share their thrill-filled fun at tourist trophy races, rallies, gypsy tours, endurance runs, hillclimbs and other sport-packed motorcycling events.

See your Harley-Davidson dealer at once — learn about the great times members of motorcycle clubs are having — and get details of his Easy Pay Plans. Mail the coupon NOW!

WINS "JACK PINE" 15th Consecutive Year!

Again in 1939, the 500-Mile National Jack Pine Endurance Championship — toughest of all motorcycle tests — goes to Harley-Davidson! All classes — A & B Solo and Sidecar, Dealer and Club Teams!



FREE — This big 24-page magazine filled with pictures and stories of thrilling, exciting, motorcycle events.



HARLEY-
WORLD'S Champion MOTORCYCLE
DAVIDSON

SEND COUPON NOW
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Dept. P, Milwaukee, Wisconsin

Send FREE copy of "ENTHUSIAST" motorcycling magazine and literature on your new 1940 models. Stamp is enclosed for mailing cost.

Name _____
Address _____

9/11/2

Treasure Hunting Up-to-Date

(Continued from page 803)

wider applications. It is the kind of research that every large industry must conduct, if it is to hold its own in modern competition. It is the kind which engages the major portion of the activities in all industrial laboratories, and it is the only kind undertaken in most of them.

The other kind of research is in pure science. It seeks new facts for their own sake, with no definite commercial goal in view. It is the kind of research which opens up unexplored territory. It is to it we must look for the discoveries revealing the un-



Fluorescent lamps, one of the newest products of research, offer high light output from low wattage

suspected possibility of radically new developments, and opening new fields for industrial activity.

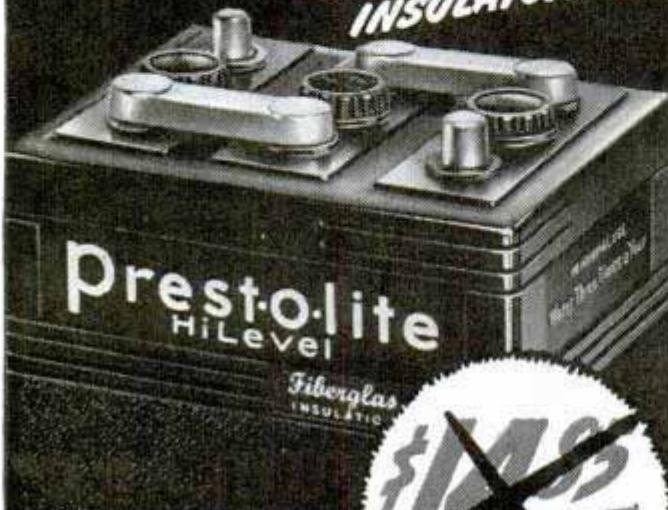
But like all pioneering, such research is a gamble. From its very nature it is impossible to foresee what the practical results, if any, will be, or in what field they may find application. It therefore follows that an industrial company, however large, if its field of interest is narrow, can hardly justify a large amount of fundamental research. It is only when a company's interests are many and diverse that it has a fair chance of cashing in commercially on research in pure science.

Such is the case with the General Electric company, and this fact was realized by its leaders in 1900. When, therefore, it started its research laboratory in that year,

(Continued to page 152A)

BATTERY MIRACLE

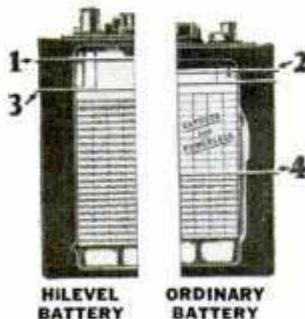
1. WATER ONLY THREE TIMES A YEAR
2. 51 BIG POWER PLATES
3. FIBERGLAS INSULATORS



It's Prest-O-Lite's Amazing New **SILVER JUBILEE Hi LEVEL** WITH 7 REMARKABLE FEATURES

WHAT a battery—and what a PRICE! Fiberglas insulation! 51 big powerful plates! Rugged construction that means no power leakage! Plenty of punch for winter starts! All these features, PLUS the Prest-O-Lite HiLevel principle that makes it necessary to water this battery only 3 times a year under normal usage. See your Prest-O-Lite dealer NOW—save time and money with this new Prest-O-Lite SILVER JUBILEE Battery.

PREST-O-LITE BATTERY CO., INC., INDIANAPOLIS, INDIANA
Manufacturing Plants at: Indianapolis, Niagara Falls, Oakland,
Oklahoma City, Toronto



HOW HiLEVEL FEATURE WORKS

- 1 FILLING LEVEL of Hi-Level Battery. (Note extra height.)
- 2 FILLING LEVEL of ordinary battery.
- 3 By the time the fluid in a HiLevel Battery drops to here, (note plates are still covered)...
- 4 ...in an ordinary battery it falls to here, leaving a large part of the plate surface exposed and powerless.



Prest-O-Lite
HiLEVEL BATTERY

Action! Color! Night Shots!

AT $\frac{1}{3}$ THE PRICE OF FOREIGN SPEED CAMERAS!

Now you can take thrilling, split-second *action* pictures! By night, as well as by day—in color, as well as black-and-white! The sensational new Mercury embodies every important feature of the expensive foreign-made speed cameras!

CHECK FEATURES: 1/1000th second focal plane shutter! Tricor deep-focus f3.5 lens! Built-in flash synchronizer! Automatic film transport (double exposures impossible!) Interchangeable lenses! Helical focusing mount! Quick-action, simplified controls! Uses economical UniveX 35 mm. film that cuts your negative costs in half! (Color shots 5¢ each!) See it today! Many dealers feature easy-payment terms.

PROOF! Unbiased tests show that the Mercury has the most accurate shutter speed of any candid under \$500! All UniveX Cameras are 100% American-Made.

\$25

TRICOR Deep-focus f3.5 Lens!

Universal Camera Corp.
Dept. M-65, New York City

FREE

Please send free illustrated booklet describing the many features of the new UniveX Mercury Super-Speed Candid.

Name _____

Address _____

City _____ State _____

1/1000th Second MERCURY

ACE
LATHE TOOL SET
\$14.50

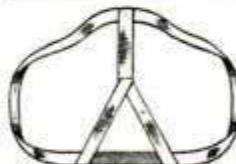
Be permanently tooled-up
for every operation on
your Metal Cutting Lathe

The ACE Set is complete—there's nothing more to buy. Drop forged by the manufacturers of cutting tools used by 90 per cent of the plants and shops in industry they are correctly designed, are of special steel, are finely finished, are stronger—will last a life-time. You can cut easier, faster and more accurately with ACE TOOLS.

At your Hardware Store—Circular FREE.
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
368 N. Francisco Ave., CHICAGO, U.S.A.

DO YOU

Want a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.



KROMER PRACTICAL FLEXIBLE SHOULDER BRACE

for correct carriage and posture. Wear it at work or play. Free booklet on "Design Yourself and Your Personal Condition" with each brace. Enclose normal chest measurement. 35c postpaid.

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IT'S LIKE HAVING
YOUR OWN BROADCASTING STATION

MYSTIC MIKE WIRELESS OUTFIT

Now! This perfected Mystic Mike Wireless Outfit, with variable frequency control, enables you to do your own broadcasting from any part of your home, office or store WITHOUT the use of any interconnecting wires. NO WIRES CONNECTED TO RADIO. Simply plug this unit into any AC or DC electric socket; speak or play music into the microphone and your voice, or the music, will be picked up by ANY radio anywhere within the same building. Use it at home for entertaining, auditions, rehearsals. Use it in your office or store as a public address system. In fact, it can serve you in hundreds of ways. Order today. Immediate delivery.

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Tear out this ad, write name and address in the margin, mail \$3.95 or order C. O. D. and we will send outfit at once.

**MASTER MODEL
\$16.50**

Modern Craftsman's Kits
KIT NO. 1 with 28 high grade accessories
and Model 1 Moto-Tool in hard-wind case
\$17.50
KIT NO. 2 same as above with Master
Model 2 \$23.50
Moto-Tool

WRITE FOR
FREE
CATALOG!

COMPLETE SET WITH
MICROPHONE
AND TUBE

\$3.95

MONEY BACK
GUARANTEE

2 11/2

(Continued from page 150A)

the primary purpose was to conduct research of a fundamental nature in the electrical field, in the hope that new facts might be discovered which would suggest new and profitable developments.

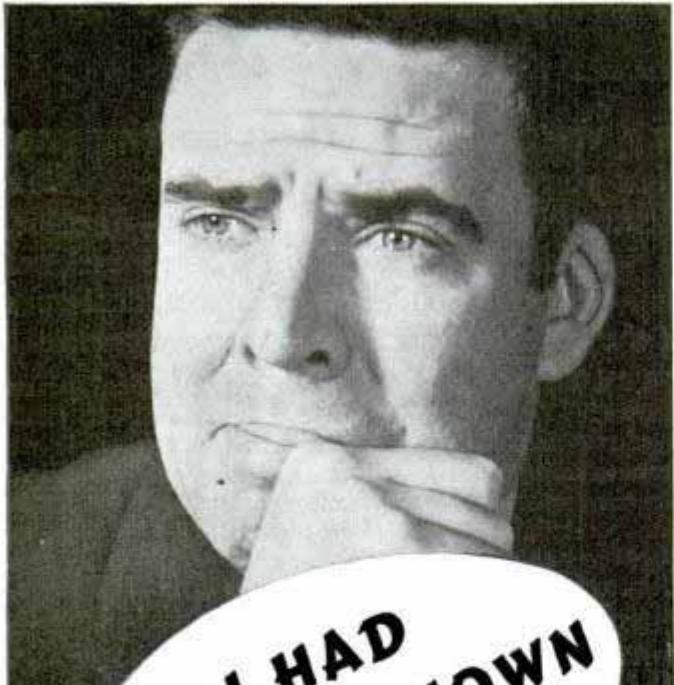
While the pressure of other work, such as giving assistance on specific problems arising in the company's engineering and manufacturing activities, and the development usually necessary to translate a newly discovered fact into a form utilizable by other departments, has restricted the amount of fundamental research the laboratory has been able to carry on, a strenuous and unremitting effort has been made from the beginning to keep as much fundamental work in progress as possible.

And it has paid.

As an example, consider the extremely fundamental work on atomic and molecular reactions done by Dr. Irving Langmuir of the G. E. laboratories. Prof. N. K. Adams of University College, Southampton, England, after describing the "apparently obtruse academic character" of Langmuir's work, said in an article last April: "Yet the reward of this type of research, carried out thoroughly where the technical staff have the ability to apply its results, is far greater than that of the type of research ordinarily allowed in industry, and it has placed the American General Electric company in a commanding technical position in their industry."

The results of two purely academic studies by Langmuir, one on the rate of evaporation of tungsten from a hot filament, and the other on the mechanism of the loss of heat from a small heated wire in air, when combined, pointed unexpectedly to a radically new and highly important development—the gas-filled vacuum lamp, which has replaced the vacuum type in all but the very smallest sizes, doubled lighting efficiency with the higher wattage lamps, enabled the incandescent lamp to compete successfully with the arc in street and projection lighting, and made possible the economic adoption of higher lighting levels wherever artificial light is used.

From the second of the two researches mentioned above came also a new method of welding, with flames of atomic hydrogen, which made easy the fabrication of metal parts such as the evaporator of the



IF I HAD ONLY KNOWN

Do you know that every fire insurance policy states that if fire occurs the insured shall furnish a complete inventory of the damaged and undamaged personal property? If you should have a fire tonight, it would be almost impossible to recollect tomorrow everything that was missing.

Get this free Household Inventory Booklet. It helps you make a complete list *before fire strikes!* It suggests objects frequently forgotten. It lists rooms one by one. Make an inventory right away and keep it in a safe place. It will save you work, worry and dollars and cents if you should have a fire. Send the coupon. It costs nothing. No obligation.



THE AMERICAN INSURANCE GROUP
Dept. 2813, 15 Washington St.
Newark, N. J.

Without charge or obligation, please send me your Household Inventory Booklet.

Name *M* _____

Street _____

City _____ State _____

J W. 2

electric refrigerator, which otherwise would have been difficult and costly.

Another research, the purpose of which was simply to resolve the apparent contradictions in the observations of other experimenters on the so-called "Edison effect," led to the discovery of the space charge law, and pointed the way to the development of the high-power, high-vacuum tubes which made radio broadcasting possible. It also gave the lead to the development of a radically new design of X-ray tube, the Coolidge tube, which has superseded all other types and has greatly extended the reliability and power range of X-ray technique.

Langmuir's later work, on the mechanism of adsorbed films, has opened up a



Monel-metal gasoline storage tank being fabricated by the atomic-hydrogen welding process

wholly new branch of chemistry, two-dimensional or surface chemistry, brought him the Nobel prize, given us more efficient radio tubes, brought revolutionary changes in the froth-flotation process of ore separation, yielded a better understanding of the mechanism of lubrication, led to the production, not yet commercial, of non-reflecting glass, given the biophysicist and biochemist a new and fruitful technique for studying the proteins, which constitute much of our bodily tissue and control most of our vital functions, and cast much new light on the size and shape of molecules, the forces that bind their atoms together, and the reactions between molecules. While much of this new knowledge has as yet found no application in the company's work, its scientific importance is very great.

(Continued to page 155A)



Caught with a Speed Graphic by Robert G. Chick

GRAFLEX and SPEED GRAPHIC Prize-Winning Cameras ★ Praise-Winning Gifts ★

You can make no finer gift choice—for yourself or any other picture-taker—than a Grafex or Speed Graphic Prize-Winning camera. American-made by master craftsmen they are the first choice of those who strive for better pictures.

The great versatility of these cameras is winning prizes and recognition for owners everywhere. Choose from your Dealer's selection of Grafex and Speed Graphic cameras and accessories.

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National GRAFLEX

Because it features full vision focusing, focal plane shutter speeds to 1/500 and an f.3.5 Bausch & Lomb Tessar lens, this camera has been called the finest of American-made miniature reflexes. Makes ten album-size pictures on each 8-expo \$87.50 sure film. Price.....

2 1/4x3 1/4 Miniature SPEED GRAPHIC

One of the most popular of all cameras! Small, compact, it has all recognized Speed Graphic features plus new and advanced ones including built-in focal plane shutter flash synchronization and parallax correcting tubular view finder. Price (dependent upon lens selected) \$111.00

Accessory coupled range finder (illustrated) \$27.00

2 SPLENDID PHOTOGRAPHY BOOKS

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FOLMER GRAFLEX CORPORATION
DEPT. PM-3, ROCHESTER, N. Y., U. S. A.

Please send me your free Grafex catalog and free Grafex Gift Guide.

NAME _____

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CITY _____

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GRAFLEX Prize-Winning CAMERAS



60¢ to \$5



Gift Set No. 305. Woodcraft Knife with Staghorn Handle, Waterproof Match Box and Coat Compass. Postpaid, \$5.00.

No gift you can make will bring greater pleasure. Every true sportsman knows the name "Marble's" stands for highest quality.

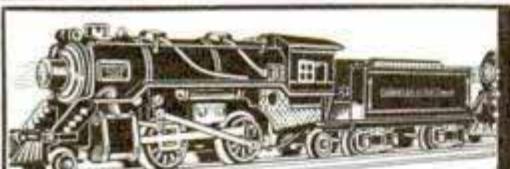
In addition to the two Gift Sets shown above, we recommend the following:

- No. 181 Marble's Waterproof Match Box. Postpaid, 60¢.
- No. 182 Marble's Coat Compass, stationary dial. Postpaid, \$1.25.
- No. 082 Marble's Coat Compass, revolving dial. Postpaid, \$1.50.
- No. 187 Marble's Wrist Compass, with leather strap. Postpaid, \$1.50.
- No. 60 Marble's Sport Knife, 4 in. blade, leather handle with leather sheath. Postpaid, \$1.50.
- No. 2 Marble's Safety Axe. All steel handle. Blade protected by folding guard. Postpaid, \$3.25. No. 6, wood handle, \$2.25.
- No. 304 Gift Set like No. 305 shown above, but knife has leather handle. Postpaid, \$4.00.

Order direct if your Dealer does not carry the items you want.

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Brings you advance news on American Flyer 15 sensational new features. Gigantic double-header freight . . . first talking railroad station that automatically stops your train, produces true-to-life sound effects and starts your train again . . . the only never-fail automatic couplers . . . new uncouplers that uncouple cars with speed and realism . . . new remote control electromagnetic loading and unloading crane . . . new Lucite block signal system . . . automatic and remote control whistle and other exclusive features. Mail coupon or post card. American Flyer Trains, 513 Erector Square, New Haven, Connecticut.

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Waterproof Match Box and Coat Compass. Postpaid, \$1.75

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Amazing Bargain. Beautiful, novel Pictorial Photo Statuette made from any photo of child, adult, group or pet. Six inches high on fine bronze-tone base. Formerly 98c. Now special at 25c to introduce our service. Send photo film with 25c coin or stamps. Money-back guarantee. Film returned with order. Details on Hand-Painted, Natural Color Photo Statuette sent FREE. Send order today.

FORMERLY SOLD AT
98¢



HARTLEY STUDIOS

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\$13.95

Full Set



MICROMETERS

Six piece set, in velvet lined leather case. Special price, only \$13.95. Precision machined in one thousandths, up to 4" outside and 3 1/2" inside measurements. Guaranteed accurate, easy to read and adjust. Satisfaction guaranteed or money back. This is your opportunity to get one at a Bargain Price if you act now. Shipped prepaid on receipt of remittance. On C.O.D. shipments, send deposit of \$2.00.

FREE FOLDER

MICRO PRODUCTS, 529 E. Jefferson Ave., Detroit, Mich

Build SCALE-PERFECT SHIP MODELS!



NEW CATALOG, 36 pgs., contains full-page illustrations of many historic ship models and racing sailboats; describes complete Construction Kits, including precision-shaped hulls, FINISHED FITTINGS, for building ACCURATE scale models. Send 15¢, coin or stamps, for catalog.

MARINE MODEL CO. 174 WORTH ST. DEPT. M11 NEW YORK



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WORLD'S BEST LINE OF TRAILER AXLES, HITCHES AND PARTS—Complete house trailer working blue prints only 50¢; WRITE TODAY FOR THIS NEW FREE CATALOG.

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FROZEN FOOD

Make money in this fast growing new industry. You can build freezer and storage cabinets for own use or sale. New construction amazingly simple. Buy parts wholesale. Send 25¢ for complete information.

SIERRA MADRE ENG. CO., Box 282, Sierra Madre, California

New Adding Machine Fits vest pocket! . . .

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells to offices, stores, homes—wherever figures are used. Write quick for FREE AGENTS sample offer and Money-Making Plan.

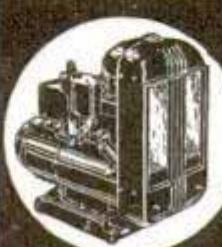
VE-PO-AD, Dept. 199, 303 W. Monroe St., Chicago



Costs only \$1.95

HANDY TAPS and DIES . . .
Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store
HENRY L. HANSON, WORCESTER, MASS.

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ONAN ELECTRIC PLANTS furnish 110 Volt, 60 Cycle, A. C. Current same as City Power Lines for Farms, Camps, Construction Jobs and Emergency Service in Hospitals, Schools, Theatres, Public Buildings. SAVE PROPERTY, even LIVES in case of Power Line Failure. Thousands in use in all parts of the World. Operate Lights, Radios, Water Systems, all Appliances. Models 350 to 50,000 Watts, 12, 32 and 110 Volt D. C.—110 or 220 Volt A. C. Also Combination A. C.-D. C. Units. Manual, Full-Automatic and Self-Starting Types. Shipped COMPLETE—READY TO RUN, \$99 and up. Write for details.

D. W. ONAN & SONS
1640 Royalston Ave.
Minneapolis, Minn.

(Continued from page 153A)

While Langmuir has been responsible for more fundamental research than any other member of the staff, others have contributed in various fields. Studies of crystals, their magnetic properties along different axes, and the factors controlling their orientation, pointed the way to the recent development of highly superior silicon steel strip, which has materially reduced the weight, size and cost of distribution transformers.

Studies of the dielectric properties of gases under pressure have led to the use of gas of the Freon type, at forty-five pounds pressure, instead of oil in a recently built million-volt transformer for X-ray use, with enormous saving in weight.

Fundamental studies of arc characteristics have shown the great effect in extinguishing arcs producible by suitably arranged cooling surfaces, and have led to improvements in air circuit breakers.

Studies of the mechanism of "creep," the slow yielding of metal under stress at high temperature, have made possible the development of alloy steels more than twice as resistant to high-temperature stress as those before available.

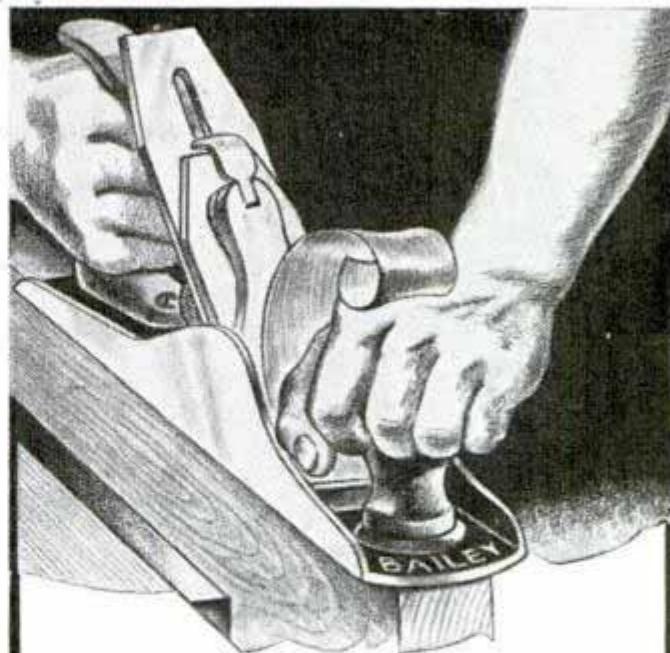
Many new facts have so far found no application, but the search for more goes on. Whether or not some new development, leading to a great new industry like broadcasting, is to appear in the near future, nobody knows. We do know that, if it comes, it will have had its origin in fundamental research.

CIGARET JUMPS OUT OF CLOCK WHEN DIAL IS TURNED

Cigaretts are dispensed one at a time at the top of a clock that is mounted on a leather case. It holds a full pack of twenty. When the dial is turned an inner-spring mechanism causes a cigaret to pop out.



Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



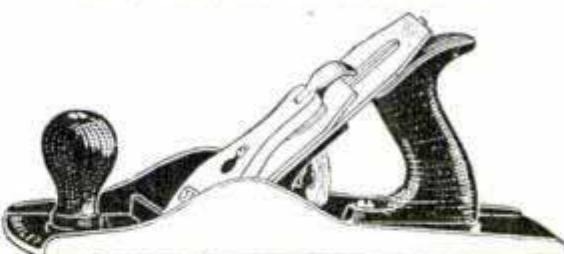
STANLEY PLANES

The Choice of All Woodworkers

For over 70 years, Stanley "Bailey" Planes have been a Number One tool in the tool kits of woodworkers everywhere.

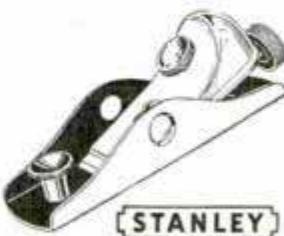
Today there is a Stanley Plane for every conceivable purpose . . . from simple smoothing to elaborate decorative cuts. To give you an idea of the variety of planes available from Stanley — there are 121 different ones described in Stanley Tool Catalog No. 34. Send for a copy of this catalog.

Two Leaders in Their Class



No. 5 Stanley "Bailey" Jack Plane. The most popular plane in the world. 14" long — cutter 2" wide. There are ten other sizes of this plane.

No. 118 Stanley Block Plane. Companion to the famous No. 5 Jack Plane. All steel parts make it practically unbreakable. Minimum number of parts. Lowest cutting angle. Go to your hardware store.



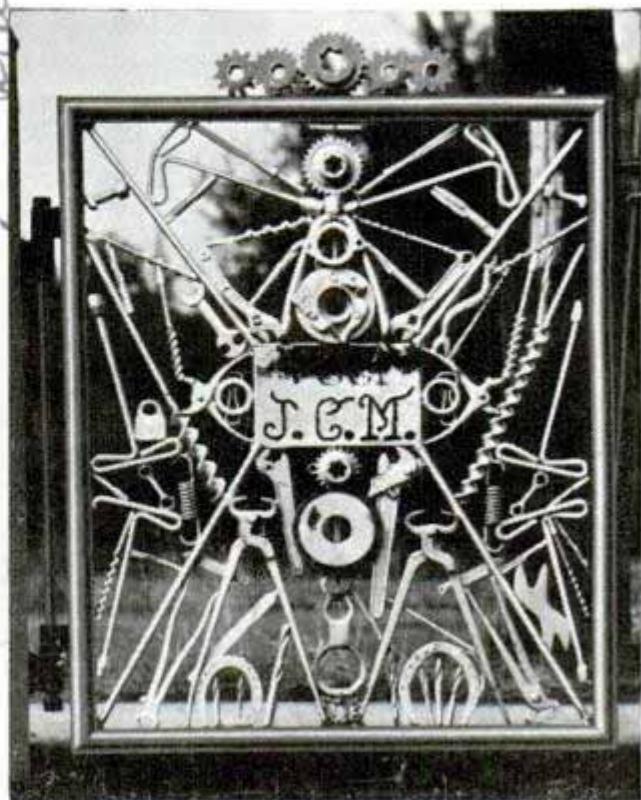
STANLEY TOOLS

Division of The Stanley Works, 105 Elm St., New Britain, Conn.

THE TOOL BOX OF THE WORLD

21098

Garden Gate of Welded Tools Designed by Mechanic



Snap them with **G-E MAZDA PHOTO LAMPS**

Thanksgiving, Christmas, birthdays... there'll be lots of good times in *your* home this Fall. And every one of them says "Time for pictures!" *Take them*, indoors or at night... and get good, clear shots with G-E MAZDA Photo Lamps.

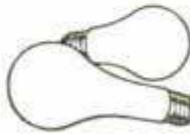
GET READY NOW

FOR ACTION, and shots you can't re-take, be sure to get the new G-E MAZDA Photoflash lamps... No. 11 15¢

(It pays to buy the handy holiday package of six, so you'll be ready for several pictures . . . only 90c.)

FOR DOZENS of snaps with new super type film, or for home movies, get G-E MAZDA Photoflood lamps.

G-E NO. 1 PHOTOFLOOD 20¢
G-E NO. 2 PHOTOFLOOD 40¢



GENERAL ELECTRIC
MAZDA PHOTO LAMPS

John C. Messermech
Tools, gears, horseshoes and other metal objects were welded together to make this garden gate

Symbolizing the trade of its designer, a garden gate constructed by an airplane mechanic consists of an assortment of wrenches, drills, pliers and other tools welded together. These instruments were discarded as unfit for use in the shop. To complete the gate's design, other odds and ends of metal such as horseshoes, bottle openers and gears were added.

Large Vanadium Mine in U. S. Assures Ample Supply

John C. Messermech
Within the space of a few years, the United States has leaped from among the smallest to the largest producer of vanadium, a metal that is in great demand both in war and peace. In 1936 only sixty-three tons were produced, but by 1938 the total jumped to 732 tons. The change was brought about by the development of a mine tucked away in a wild and lonely section in southwestern Colorado, sixty miles from the nearest railroad. It is believed there is enough ore to keep the plant going for 100 years. By its effect of increasing the toughness and "springiness" of steel, vanadium has become well-nigh indispensable in the manufacture of automobiles, and has many direct uses in war.

Vanadium Corp.

The One BIG New Engineering Feature in the 1940 Cars!



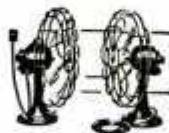
HYDRA-MATIC DRIVE

A Combination of Liquid Coupling and Fully Automatic Transmission

For years it's been coming! Today it is here! For 1940, Oldsmobile introduces what automotive engineers have long been working toward — a completely automatic drive. Here's a combination of a closed-circuit, turbine-type liquid coupling and a hydraulically operated, four-speed automatic transmission based on two planetary gear sets hooked up in series. It's

the sensation of the automobile industry! See your Olds dealer. Try an Olds with Hydra-Matic Drive. Get free illustrated booklet.

How It Works



Face two electric fans toward each other. Start one, and the motion of the air will run the other. The same thing happens in the liquid coupling of Hydra-Matic Drive, except that oil takes the place of air.

More Than Just a Fluid Flywheel



Ordinary fluid couplings add a fluid flywheel and an over-drive to a conventional clutch and transmission. Hydra-Matic Drive eliminates both clutch and sliding gears.

OLDSMOBILE

BIGGER and BETTER in EVERYTHING



**AMERICA'S
BIGGEST
MONEY'S
WORTH**

Quiz

Q. What anti-freeze has proved itself in more automobiles than any other brand ever made?

A. "Prestone" Brand anti-freeze—America's most popular winter protection. Contains NO alcohol...NO glycerine. Lasts all winter!

(SEE PAGES 120a and 131a)

RENEW OLD BUILDINGS WITH **PLASTIC STUCCO**

STUCCO SPRAYING MACHINE

It fuses a plastic mixture to any masonry surface. It waterproofs and fills all cracks. It can be applied in any thickness desired and in 30 colors. Fully proven by over thirteen years actual use under all conditions and every climate.

BIG EARNINGS. Operators report costs of 2c and up per sq. ft. and sell up to 7c. Machine covering capacity up to 1000 sq. ft. per hour soon pays for itself. Make money by supplying the big waiting market for renewing both old and new buildings with permanent color at low cost.

Get the facts. Send for books, "Proven Business Opportunity." Write today.

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570 Ottawa Ave., Holland, Michigan

AMERICA'S Newest Hobby

Make dull moments delightful, creative, educational. Turn your spare hours into cash. Master the fascinating new art of **plastic carving**, now made easy for all with **Moto-Tool NICK NACK Carving Kit**. Make useful, colorful giftware, toys, statuary, costume jewelry from marble-like new plastic substance. Work out original designs of your own in wood, glass, metals...like things sold in stores at 4 to 5 times manufacturing cost. Enjoy this new hobby just for fun...or start a profitable home-work business.



Kits Include 24 Pg. Book "How to Make 41 Projects"

JUNIOR Kit with No. 1 Moto-Tool (\$25.00 r.p.m.), 17 accessories, plastic materials for 10 projects in highly finished wood case, **only \$17.85**.

MASTER Kit with factory type No. 2 Moto-Tool (\$27.00 r.p.m.), 23 accessories and plastics for 20 projects in highly finished wood case as shown, **only \$24.85**. Big project book goes with both Kits. See Moto-Tool "Nick-Nack" circular.

DREMEL MFG. CO., Dept. K-119-M, Racine, Wis.

NOTICE

Motor-in-Hand Tool Owners! Carving Project Book exactly as furnished in Kits, sent separately, for only \$1 Postpaid.

Kits at your dealers, or order direct. Send remittance and we pay postage—or send \$2.00 and pay postman balance plus postage. Write for circular.

Decidedly Unusual... THURSTON'S 1940 CATALOG of "HARD-TO-GET" MATERIALS"

For Homecrafters, Schools, Institutions, Antique, Novelty and Cabinet Shops

A few of the items we show: Chest hardware, locks, hinges, supports, casters, copper trim, etc., also midges, overlays, etc. Finishing materials, glue, stains, varnish, wax, flint and garnet papers, rubber sanding blocks, stick sheathes, burning-in knives, etc. Upholstering supplies and coverings. Complete line of electrical findings for lamp manufacture, also cluster and indirect fixtures. Chair cane, woven and in strands, spline, reeds, fibre cord, etc. Trays for smoking stands and glass liners. Large line electric and spring clock movements, with and without dials. Complete line Venetian Blind hardware, tapes and cords. Table slides and leaf supports. Ten wagon wheels and casters. Wood dowels, also dowel screws, dowel centers, wood screw hole buttons. Excellent line card table leg supports. Bed hardware of every description. Desk pens, complete with funnel and fastening, without base. Water transfers, inlays, small moldings, etc. Furniture glides and casters, office chair spiders, wood legs and K. D. chair frames. Small box hardware of every description. Large selection pulls, knobs, handles, hinges, locks, catches, etc. Perfected steel panels, chair braces, revolving chair fixtures, rocker springs, candlestick sockets, bill board clamps, banquet table equipment, many sizes braces, corner irons, banger bolts. Step ladder braces, plaster strips, sliding track and sheaves. Typewriter desk hardware, binwings, mirrors, nut bowl hardware. Bar pins for novelties. Catalin Plastics. Crib hardware, swivel top table fixtures, sectional bookcase hardware, clamp nails, electric pens for burning, etc., etc. Send 10¢ cash or stamps.

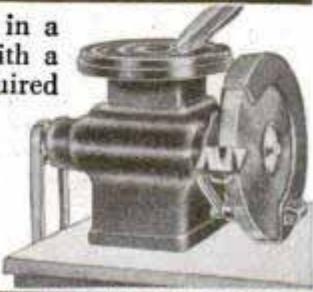
THURSTON SUPPLY COMPANY, Dept. P. M., ANOKA, MINN.

KEEP YOUR TOOLS SHARP!

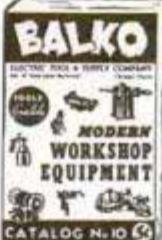
Oilstone your cutting edges in a fraction of the time—and with a fraction of the effort—required by hand.

TOOL DRESSER

Revolving Oilstone and Emery Wheel combined.
SEE YOUR DEALER
Literature Free.



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Bass 30 ARGUS

BUILT-IN PHOTOFASH SYNCHRONIZER
Coupled range finder... accurate from 3 feet to infinity. F:3.5 "Cintar" lens... 1/5th to 1/300 sec. speeds. Uses 35mm movie film. Model C3, complete - - \$1300
Send for Bass Bargaingram — mention still or cine.

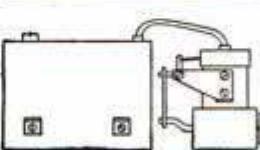
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179 W. MADISON ST., CHICAGO, ILL.



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Toolmakers and machinists will prize their Gerstner Chests for long years to come. Free Catalog.

GERSTNER TOOL CHESTS
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Dayton, Ohio



A DEPENDABLE STEAM ENGINE for boat models up to 36" in length. Model SE-3, a two cylinder, slide-valve type. Bore 5/16", Stroke 1 1/4", Length 7", Width 3", Height 3 1/2". Price complete ready to run with burner and propeller... \$3.00 Postage extra, shipping weight 1 1/2 lb.

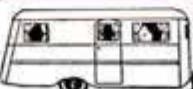
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Complete Plans and Building Instructions. 10¢

**"Carving" Made Out of Butter
Depicts Kitchen Scene**



Beaurevee January 15/60
Table and figure of housewife were carved from 400 pounds of butter and exhibited at Kansas fair

Butter provided the material for the sculptor who carved in full size a common kitchen baking scene. Four hundred pounds of the dairy product were used in the figure which was exhibited by a creamery company at a Kansas fair in Topeka.

Bree J 1/60
**Plants Bred with Wonder Drug
Yield "Giant" Seeds**

Taller corn yielding more bushels to the acre, fluffier cotton bolls and bigger and juicier peaches and pears are some of the plants of the future that may result from modern breeding with the aid of colchicine. These possibilities were first demonstrated by Dr. A. F. Blakeslee of Carnegie

stituⁿ, who applied the method to aⁿ plants ranging from radishes to phlox. Today there are probably hundreds of experimenters at work in the field, breeding more than a dozen different plants. In its purified form colchicine is a crystalline powder, and so powerful is it that it can be used only in a diluted solution. When this is injected into a plant or sprayed on its surface, the seeds it bears are apt to produce giants—plants that look like their parents but are much bigger and breed true to their new big size. The process may be repeated with the new generations, doubling and redoubling their size.



Saws of Craftsmanship

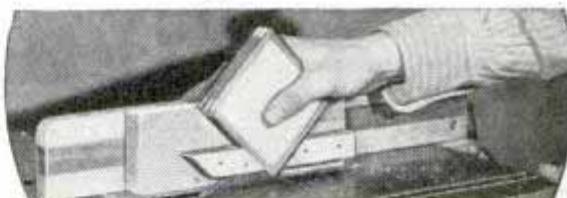
Let Disston Steel, Disston workmanship, smooth finish, accurate fitting, sharp teeth that hold their cutting edge, prove how these circular saws can help you do better work . . . even on the most intricate jobs. Ask for "Disston De Luxe" at your dealer's.

<i>Cross-cut; Rip; Combination</i>	
6" (1/2" hole) \$2.70	8" (1/2", 5/8", 3/4" hole) \$3.50
7" (1/2" hole) \$3.10	10" (5/8", 3/4" hole) \$4.50

<i>Hollow Ground Combination</i>	
6" (1/2" hole) \$4.30	8" (1/2", 5/8", 3/4" hole) \$5.40
7" (1/2" hole) \$4.90	10" (5/8", 3/4" hole) \$6.90

These prices apply only to United States; for others, write Henry Disston & Sons, Ltd., Toronto, Canada.

and the Hint of the Month



Jig for cutting mortise slots in mitred corners for inserting veneer strips to make feather joint. Holds work at correct angle and gives cut of proper depth. Temporary block inside frame lets you hold work firmly.

and a New Edition

FREE BOOK



New Disston Saw, Tool and File Manual, better than ever! 48 pages: hints like one above; also tells how to joint, set and sharpen saws, how to choose and use all kinds of saws and tools.

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If You Want to Be A BETTER CRAFTSMAN

Get the
Right Saw
For the Job



Often the finished job that looks best comes from knowing which saw to use, rather than better handling of the tools. A single hand saw is not an all-purpose tool. A rip saw does its particular job better than a cross cut would, and vice versa, while several others are each best for certain work. The right saw is an Atkins, and which type to use is explained in a helpful booklet. Send 10c for the "How To Do It Book."

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ATKINS

Silver Steel
SAWS

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18th Century Coach. Complete Kit, drawings, wood, metal, upholstery, enamel, etc. Heavy cutting done. Folder 3c. Send \$1.00—balance of \$5.50, c.o.d. Guar. value.

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AN EXCLUSIVE HOME FOUNDRY ACHIEVEMENT!

Just plug in a amazing new tool and carve wood by electricity! Set No. E-102, 6 plaques, 3 interchangeable tools; stain, brush and sandpaper. \$2.



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Exciting new war molds! Casts 3 large figures; electric casting ladle; vise; 12 pigs metal; smoking torch; 2 bottles paint, 2 brushes. Fully equipped electric casting set No. A-104, \$2.



"WONDER PEN"

New improved pen with ivory bakelite handle and white cord and plug; 12 plaques including book-ends; finishing liquid, water colors, brushes, etc. Complete set No. B-102, \$2.



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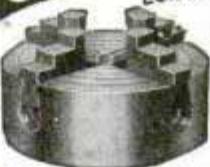
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Send draft or money order. If not
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Auto-Glide

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CUTS TRANSPORTATION COSTS WAY DOWN!

Ride an AUTO-GLIDE for a dime where it would cost a dollar to drive a car! Thrill to its 35 miles per hour speed, easy handling, convenient parking. Use it for deliveries, business, school, sport!

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IT'S THRIFTY TO INSTALL NEW CHAMPION SPARK PLUGS



Calling all Cars
A MYSTERIOUS DISCOVERY
SAVES UP TO 30%
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Stop wasting Gas!—trim dollars off gas bills—get more power—quicker pickup—faster acceleration! AUTO OWNERS everywhere praise VACU-MATIC! Proven so efficient, it is guaranteed to satisfy, or the trial costs you nothing.

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Vacu-matic is entirely different! It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air into the heart of the gas mixture. It is entirely automatic and allows the motor to "breathe" at the correct time, opening and closing as required. Saves up to 30% on gas costs, with better motor performance.

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FOR INTRODUCING. Here's a splendid opportunity for unusual sales and profits. Every car, truck, tractor owner a prospect. Send name and address now for big money making offer and how you can get yours Free. The Vacu-matic Co., 7617-477 W. State Street, Wauwatosa, Wis.

Coin-in-Slot Gasoline Pump at Self-Service Station



Self-service gasoline pump permits motorist to fill his own tank without awaiting help from attendant

Motorists do not have to wait for an attendant at a self-service filling station where the gasoline pump is operated by dropping a coin in the slot. Should the pump be empty, coins are returned automatically. The plan is to install the vending machines at rural stores, yards of large industrial plants, and other locations where attendants cannot be on the job constantly.

21675

"Costume Jewels" of Stone Age Show High American Culture

America had a Stone Age society just as cultured as Europe's. At least, the early Americans of 12,000 to 20,000 years ago, at the end of the Ice Age and beginning of Stone Age culture, wore "costume jewelry." Two decorated bone heads have been found in a camp site of prehistoric Folsom men near Ft. Collins, Colo., and Dr. Frank H. H. Roberts, Jr., of the Bureau of American Ethnology, says the artistic decorations, the red and yellow paint, and the variety of tools and weapons indicate that America's earliest known culture must have compared favorably with the Stone Age society in Europe at the same time.

Self-service gasoline pump

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YOURS!**

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"shop tested"
MACHINES**

21 MODELS

Boice-Crane completely equips your shop. Every widely used type of machine included in our 1940 line. *Saws, Lathes, Band-Jig Saws, Drill Presses, Jointers, Sanders, Planers, Shapers.*

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Boice-Crane consistently stays a step ahead with valuable and practical improvements. It's just one of the extra values all our users get.

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New Boice-Crane 1940 Catalog ready in just a few weeks. See for yourself why men who know really good tools buy Boice-Crane and nothing else!

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If you include 10c we send 16 pg. Metal Spinning Instruction Book. You'll enjoy this lathe craft!

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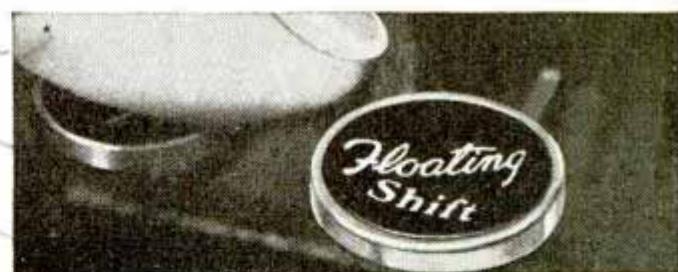
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MAKE BIG PROFITS AT ONCE

Amazing low price and magic-like demonstration brings you thousands of orders for plating from garages, radio shops, bicycle shops, machine shops, home work shops, factories, offices, janitors, doctors, dentists, jewelers and farmers, homes, stores, etc.—with big profits for you! List of plating charges furnished; also reports of remarkable daily earnings.

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Send today for FREE Sample and amazing profit details and bona fide reports of big steady earnings! Also, 3-way proven sure money-making plan. Get started at once on this permanent, profitable business. No competition. Simply mail name on penny post card—NOW! Be the exclusive Warner Nu-Way Electroplater in your community.

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This Beautiful SANTA CLAUS STATUE attractively finished in bright lacquer colors IS YOURS FOR ONLY \$2.95

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a few cents each.
1000% PROFIT!

Think of it. Your cost of manufacture will be only a few cents each and you sell them for \$2.95 each. Here is an opportunity to make some real money.

EVERY HOME | EVERY STORE | A PROSPECT!

At Xmas everyone will want a Santa Claus. It makes a beautiful table piece for the home—an excellent display piece for the store window or counter. You can easily sell hundreds, or even thousands if you get busy now.

GET STARTED NOW!

But, don't wait. Xmas is coming and mighty fast. Order your SANTA CLAUS today! Also ask for our 32-Page Book offering many other money-making opportunities. It's only 10¢ Postpaid.

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11½" x 7" x 6"

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MILEAGE GAUGE and TROUBLE INDICATOR

Thousands now on cars, giving owners MORE MILES PER GALLON OF GAS. Installs on any car in 15 minutes. Ask your auto supply dealer or sent postpaid, in U. S. A., on receipt of \$2.00.

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WELDING! The most sensational tool in 20 years. Super Magic Wand Welder weighs about one pound, easy to handle! No generators, no batteries, no special wiring! Just plug into ANY LIGHT SOCKET! With this rugged tool anyone can weld iron, steel, bronze, brass, lead, aluminum, OR ANY metal.

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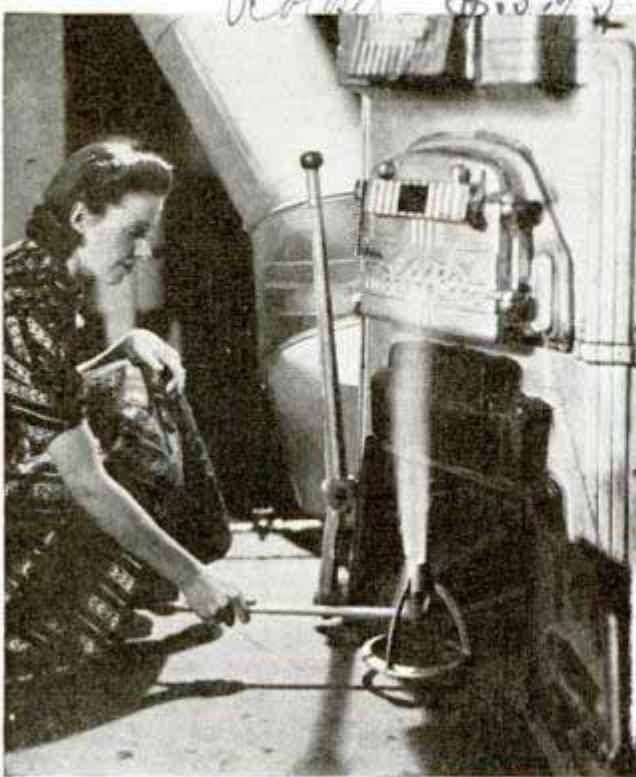
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Gas Lighter for Coal Furnace Kindles Fire without Wood

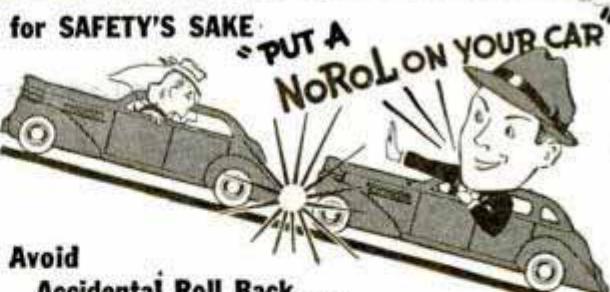


Blazing gas torch for starting furnace fires is shoved under grate by means of its long handle

Kindling a fire is as easy as lighting a water heater if you have a gas furnace lighter now on the market. No wood, paper or charcoal is needed. Turn on the gas, strike a match, set the lighter under the grate, and in a few minutes you have a blazing coal fire. Then the fire starter is withdrawn in safety by its long handle, and the gas turned off. Flexible metal tubing connects with any gas outlet, usually at the hot-water tank.

Candy Glows with a Faint Light When Dropped in Liquid Air

Crystalline candy wafers and ordinary ice emit a faint glow of light when dropped in liquid air. This glow, called triboluminescence, can also be produced by grinding the wafers in a chemical mortar. Scientists believe this phenomenal radiation is caused by the cracking of the candy or ice by sudden, severe chilling and the consequent production of frictional electricity. The amount of light varied with different flavors, wintergreen producing the most brilliant glow. Candy that had first been subjected to ultraviolet rays gave off stronger light.



Avoid
Accidental Roll Back ...

NoRoL

HOLDS CAR ON UP-HILL STOPS

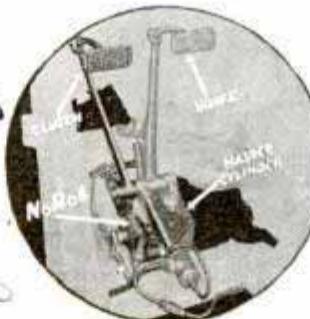
--leaves right foot free for accelerator

Don't be a brake pedal jockey! Put a NoRoL on your car and get away from a lot of leg fatigue as well as excessive wear and tear on clutch and drive mechanism.

NoRoL gives you a "third foot"—doing brake duty against back-roll on inclines, while right foot is left free for accelerator duty. Eliminates fatigue and frazzled nerves when you are driving in congested traffic on hilly roads and streets . . . Does away with chance of back-roll on up-hill start . . . Prevents unnecessary wear on clutch facings . . . Also lessens chances for clashing of transmission gears.

Easily installed . . . Built to last . . . Does not interfere with operation of brake pedal, clutch pedal or accelerator.

HERE'S HOW IT WORKS



[Illustration shows a NoRoL installation . . . Actually is out of sight. Does not alter appearance of car.]

When stopping on any incline, no matter how steep, you simply apply the brake and disengage the clutch in the usual manner. An automatic check retains the hydraulic pressure in the braking system which was developed when brakes were applied. This hydraulic pressure holds the brakes applied as long as the clutch pedal is held depressed, enabling the driver to take his foot off the brake pedal and use it for accelerator duty . . . Thus making it unnecessary to keep his right foot on the brake pedal while the car is stopped. It's like having a "third foot."

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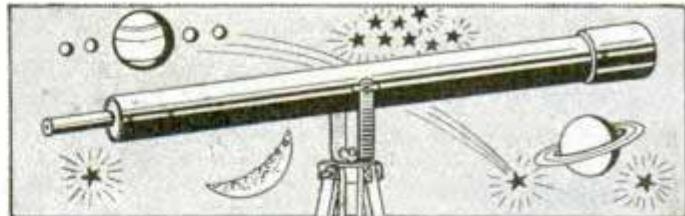
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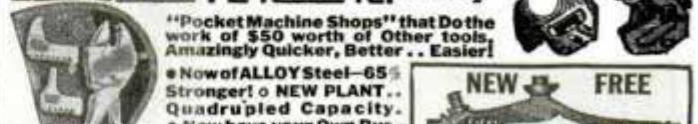


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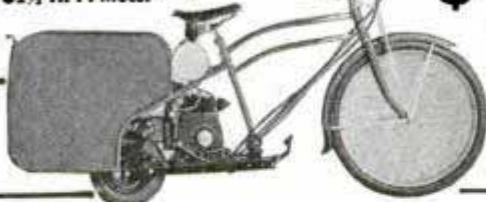
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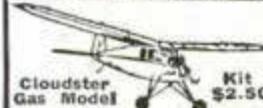
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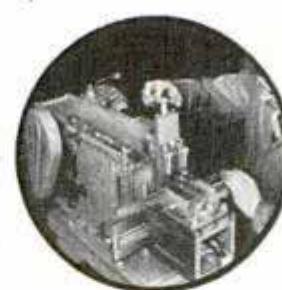
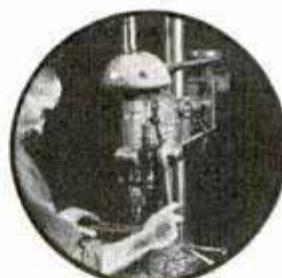


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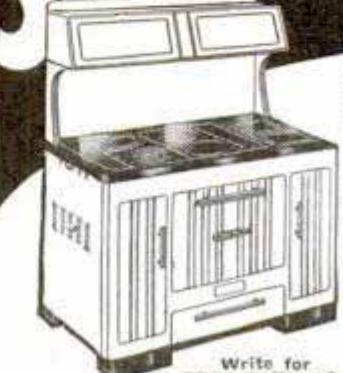
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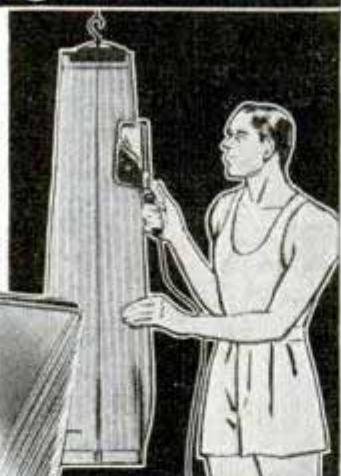
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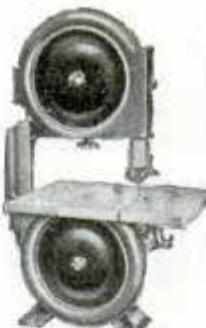
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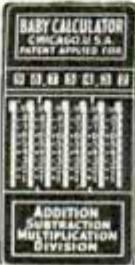
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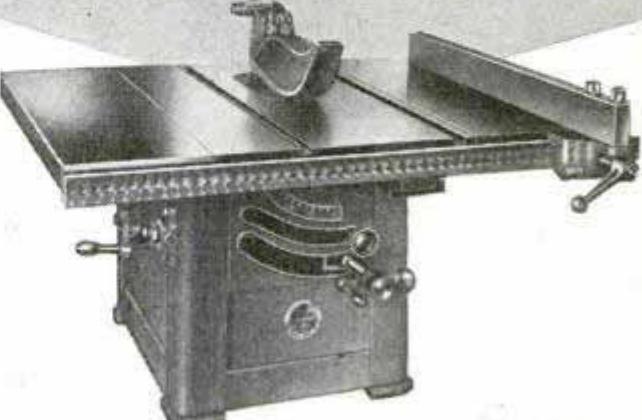
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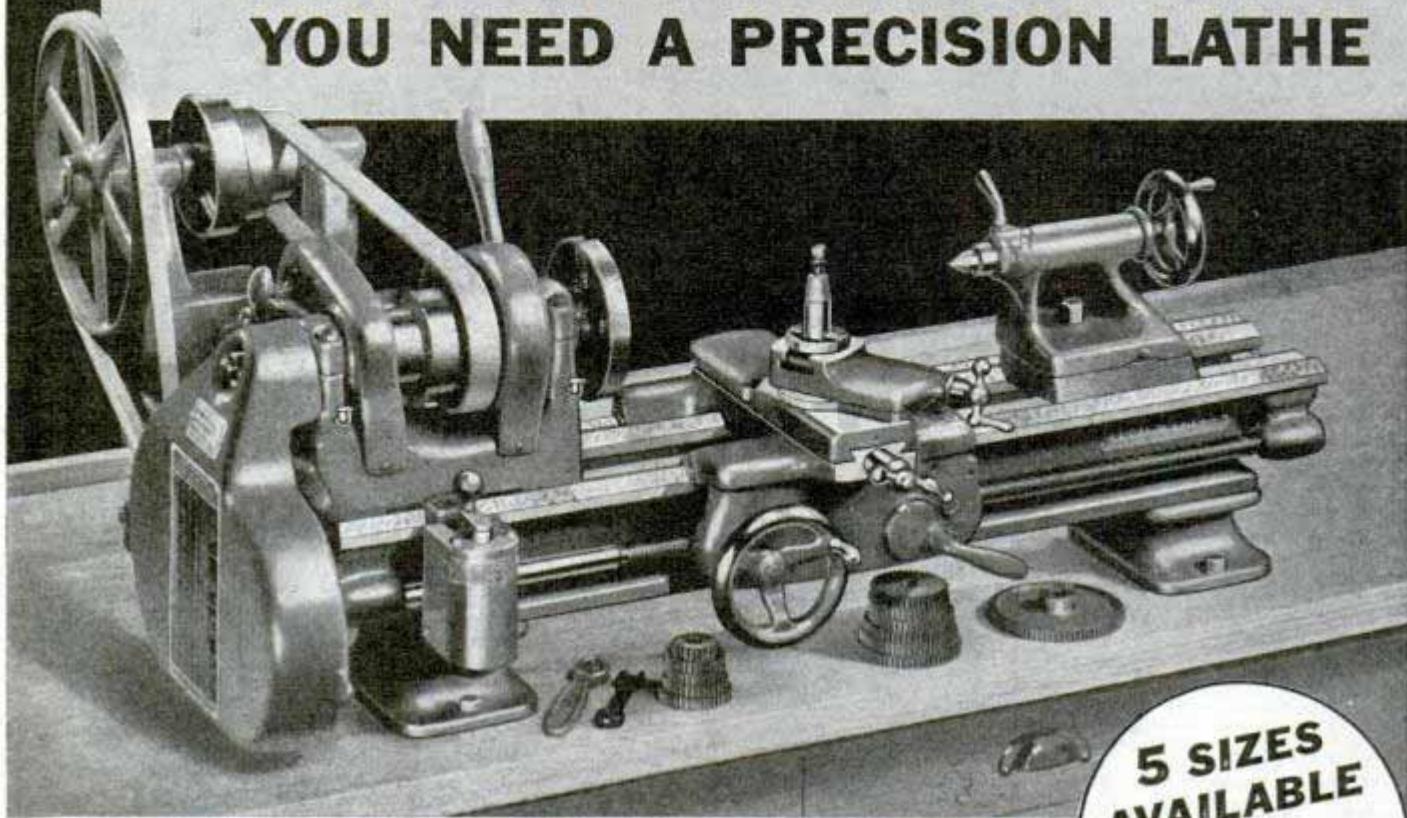
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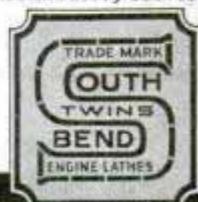
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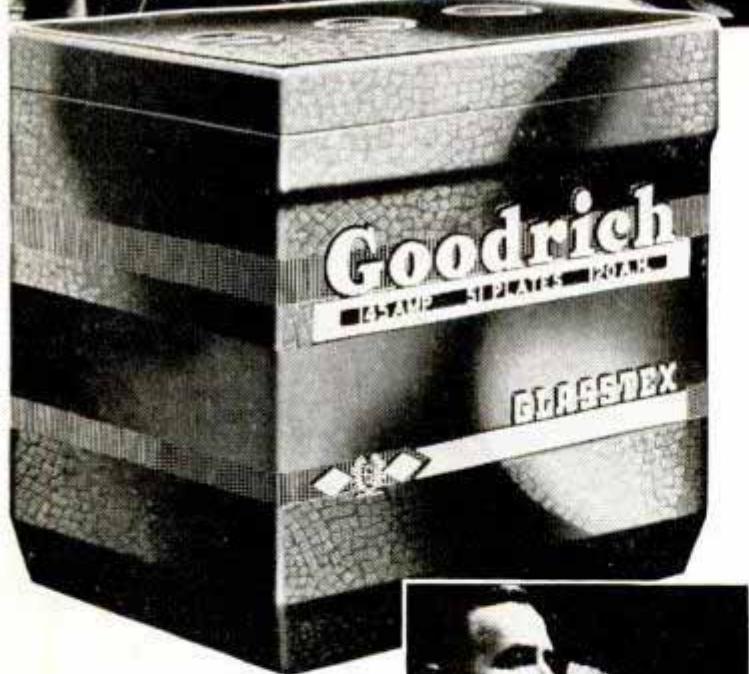
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